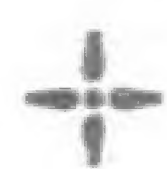


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CONTENTS:

	PAGE		PAGE
ANGLO-JAPANESE PACT SURVIVES	1	New York to Mukden	24
THE U.S.-RUSSO-CHINESE COMBINATION	1	SISAL CULTIVATION IN PAPUA	*25
BAITING THE TRAP FOR AMERICA	2	SOME ELECTRICAL DEVELOPMENTS IN CHINA	*27
THAT SECRET "ALLIANCE"	3	HYDRO-ELECTRIC POWER IN THE NETHERLANDS EAST INDIA	*35
WHY NOT?... ..	4	FAR EASTERN TIMBERS	*39
SAVING THE NATION	5	NORTH BORNEO	*42
UNDERMINING THE CONSORTIUM	6	CHINESE STUDENT INVENTS SMALLEST SUPER-RECEIVER	44
A DISASTER AVERTED	7	JAPAN'S GREATEST COAL MINES	*45
THE JAPANESE DECISION	7	THE CHINESE EASTERN RAILWAY	*55
WHEN THE WORLD WAS YOUNG	8	THE FAR EASTERN MOTORS:—	
New Map of China	10	The North American Road Situation	*59
Famine Prevention in China	10	The Closed Car Show in New York	*63
A PIONEER FOR PACIFIC PEACE	*11	Automotive Japan	*64
Lead and Zinc Mining in China	12	Co-operative Financing by Bank and Manufacturer will Triple U.S. Automotive Exports	71
THE TANGSHAN WORKS	*13	New Automobile Spark Tester makes Practical Use of Rare Gas	*72
NEW TENDENCY IN JAPAN'S SILK SPINNING INDUSTRY	19	Semi-Diesel Engines for Flying Invented	*74
RAILWAY BEARINGS	*20		

**Illustrated with Maps or Photographs*

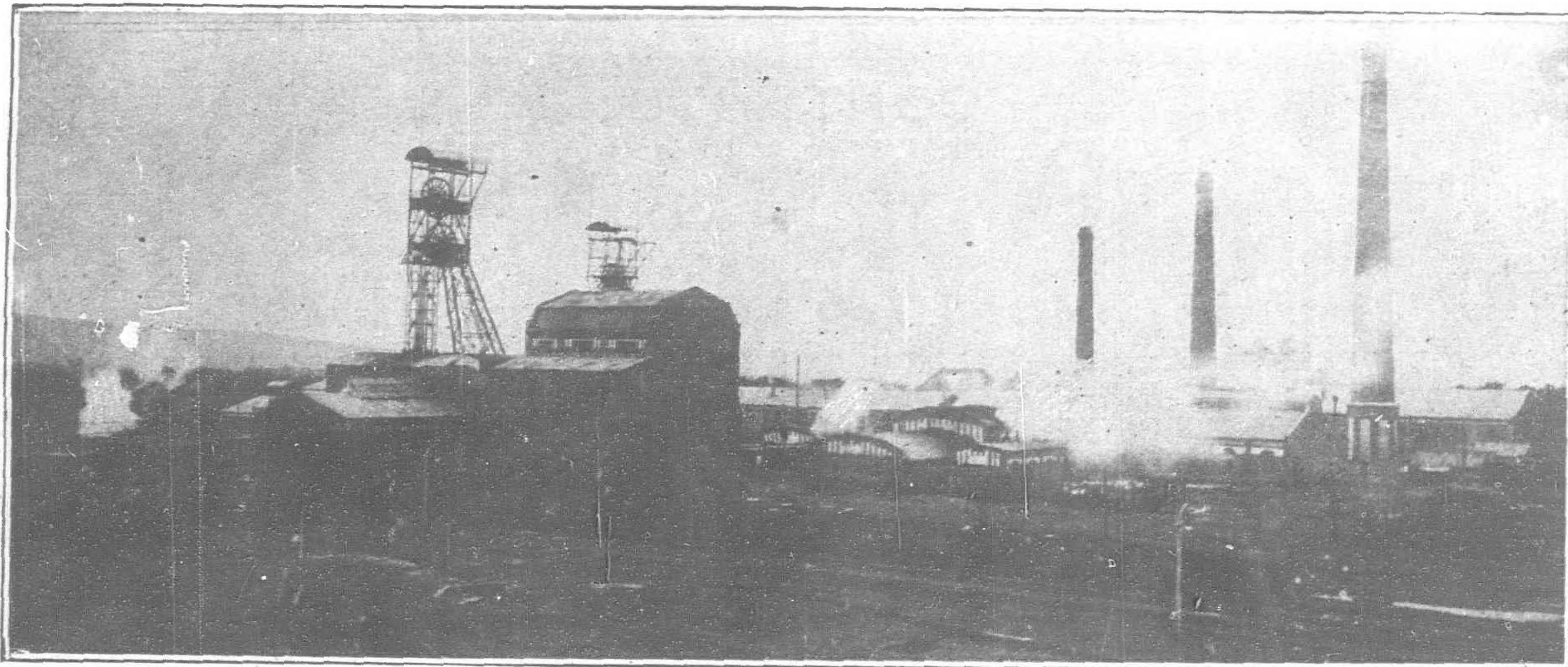
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Baldwin Locomotive Works..... 67	Hasler Telegraph Works 4	McConway and Torley Co. 39	Sulzer Bros. 73
Bank of Chosen 54	Hathorn Davey & Co., Ltd. 7	Mitsubishi Bank 61	Sumitomo 60
Bank of Communications..... 59	Heap & Co., Ltd., Joshua 53	Mitsubishi Iron & Steel Co., Ltd..... 38	Sumitomo Bank, Ltd. 60
Banque de l'Indo-Chine 56	Hongkong Rope Manufacturing Co. 20	Mitsubishi Marine & Fire Ins. Co., Ltd. 38	Superheater Co., The 73
Bank of Taiwan, Ltd. 57	Hongkong & Shanghai Banking Corporation..... 63	Mitsubishi Shoji Kaisha 18	Thornycroft & Co., John I. 1
Bliss Co., E. W. 27	Hongkong & Whampoa Dock Co., Ltd. 30	Mitsubishi Warehouse Co. 38	Toshin Soko 40
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British-American Tobacco Company (China), Ltd. 52	Imperial Japanese Government Railways 68, 69	Mitsui Mining Co. 18	United Cigarette & Machine Co. 41
Browning Co., The 65	Industrial Bank of Japan 58	Mitsui Bussan Kaisha 26	United States Steel Products Company..... 23, 37, Back Cover
Bucyrus Company 9	International Banking Corporation.. 55	Motor Rail & Tram Car Co..... 41	Walworth International Co. Supt.
Butterfield & Swire 44	International General Electric Co., Inc. 74	Mustard & Co..... 39	Werf Gusto 33
Canada Carbide Co. 15	Japan Sugar Co., Ltd..... 6	New Engineering & Shipbuilding Works..... 34	Westinghouse Electric International Co. Supt.
Chartered Bank of India, Australia & China 48	Jardine, Matheson & Co., Ltd. 12 & Supt.	Nippon Menkwa Kabushiki Kaisha.. 50	Wharton Jr. & Co. Inc., Wm. 21
Craig & Donald, Ltd. 31	Jones & Lamson Machine Co..... 53	Nippon Yusen Kaisha 46, 47	Whittall & Co., Ltd., J. 6
Dai-Ichi Ginko 62	Jugo Ginko 56	Nobel Industries, Ltd. 22	Wild & Co., M. B. 9
Dai Nippon Brewery Co. 74	Kanegafuchi Spinning Co., Ltd. 10	Okura & Co. (Trading), Ltd..... 24	Williams & Co., J. H. 21
Diamond Power Specialty Corporation 42	Kawasaki Dockyard Co., Ltd..... 35	One Hundredth Bank, Ltd., The.... 62	Yarrow & Co., Ltd..... Cover
Dixon Crucible Co., Joseph Supt.		Pittsburgh Steel Co. 57	Yokohama Dock Co. Ltd. 33
Dorman Long & Co., Ltd. 3		Pooley & Son, Ltd., Henry 2	Yokohama Specie Bank, Ltd..... Cover



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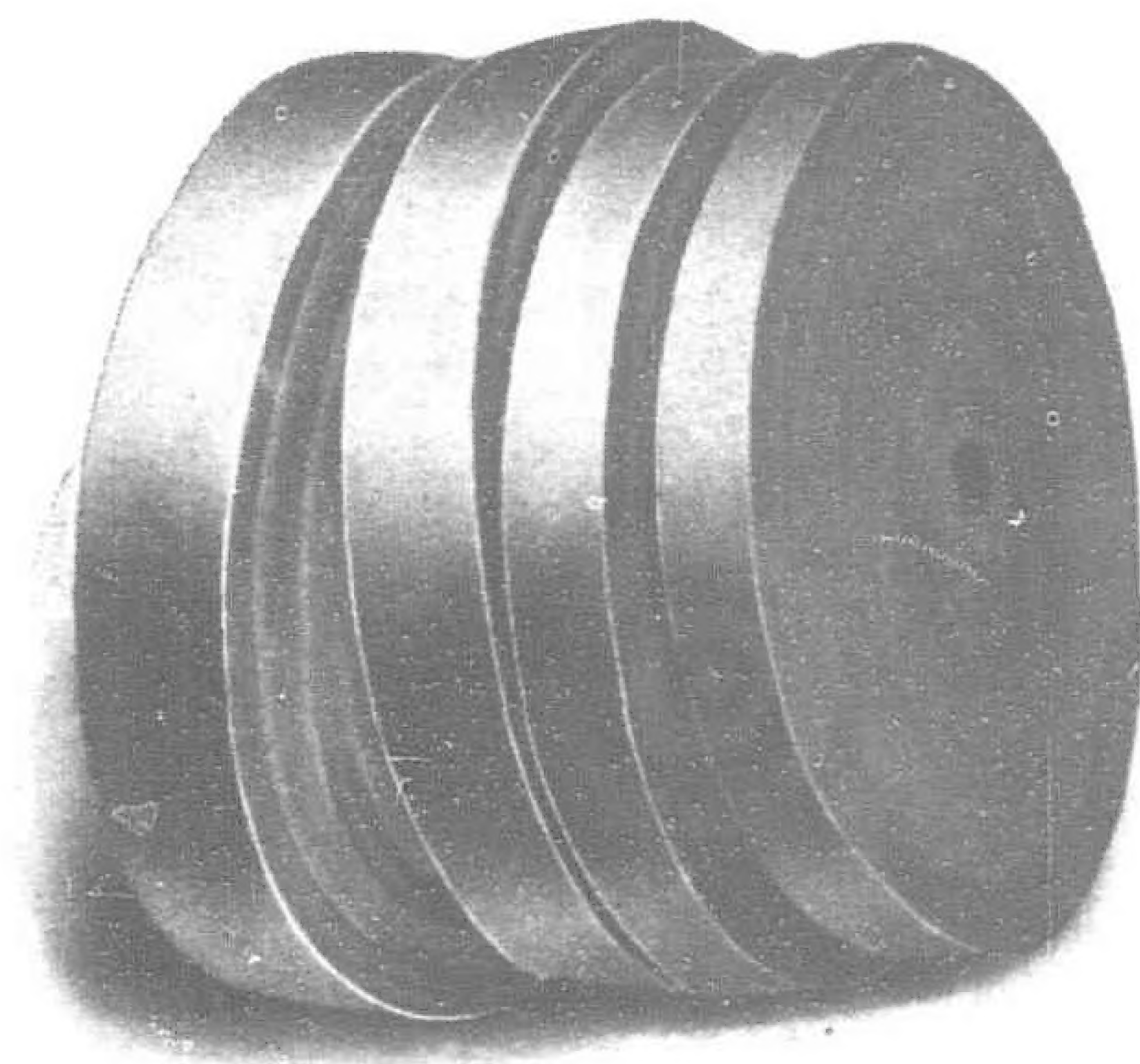
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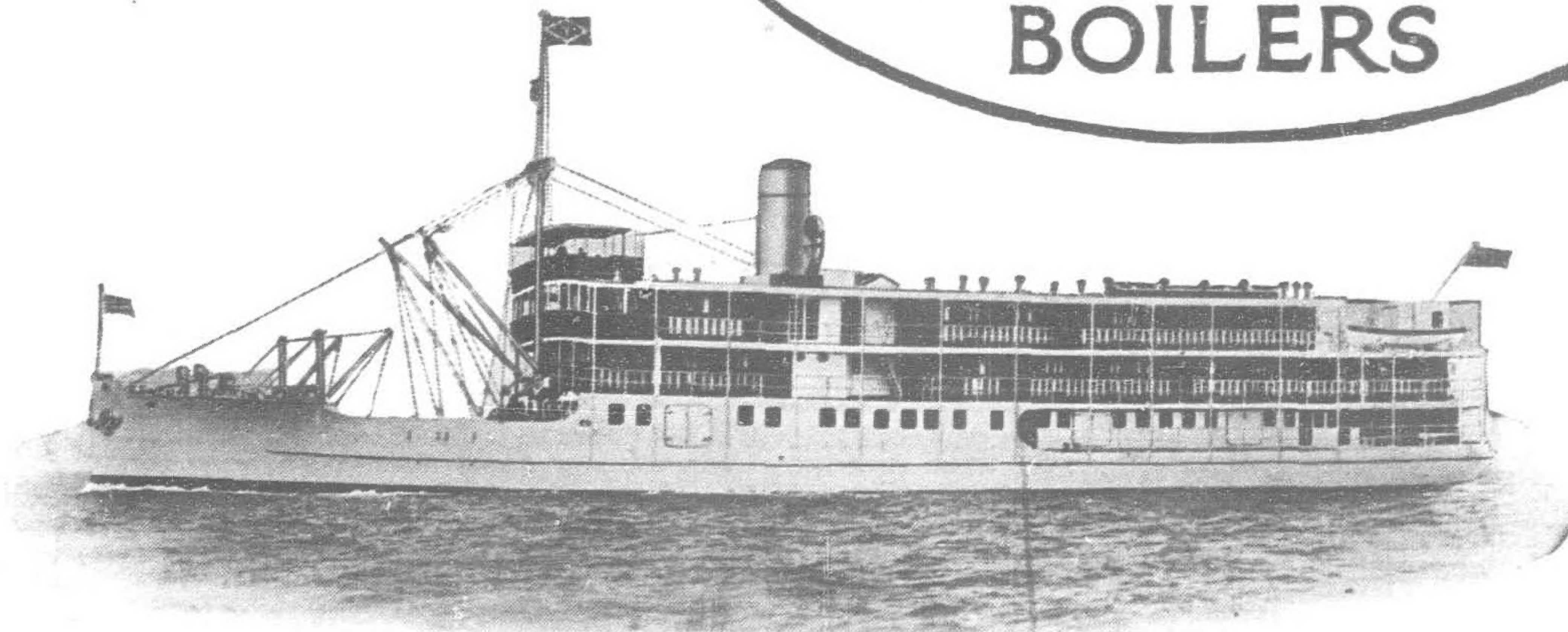
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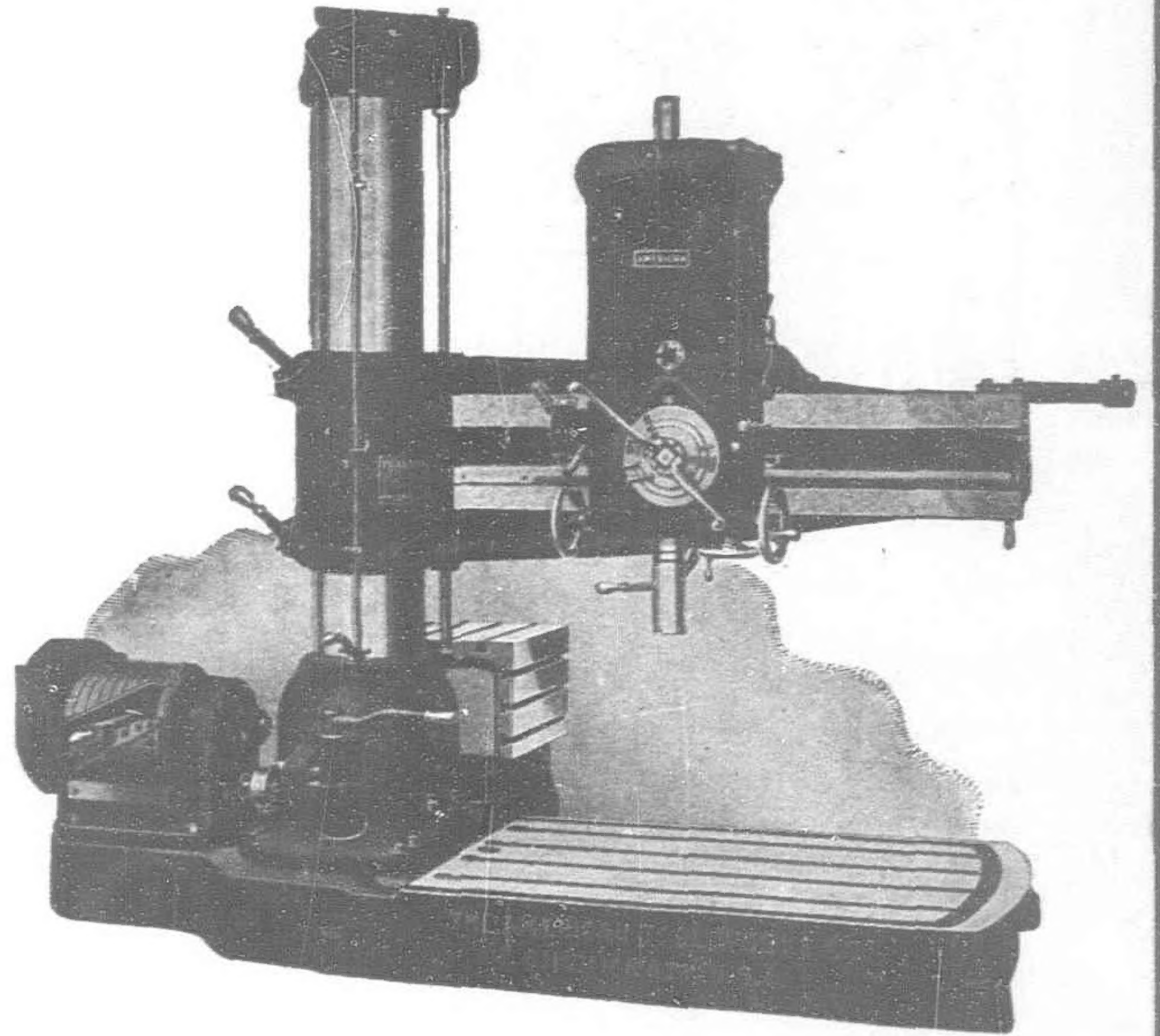
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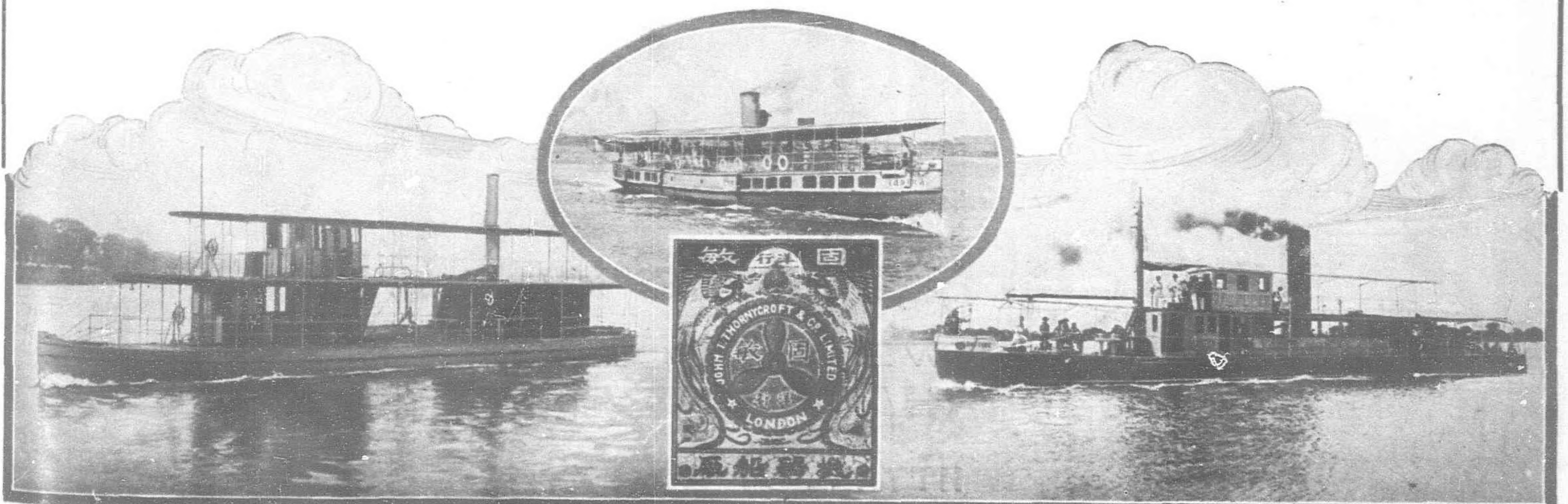
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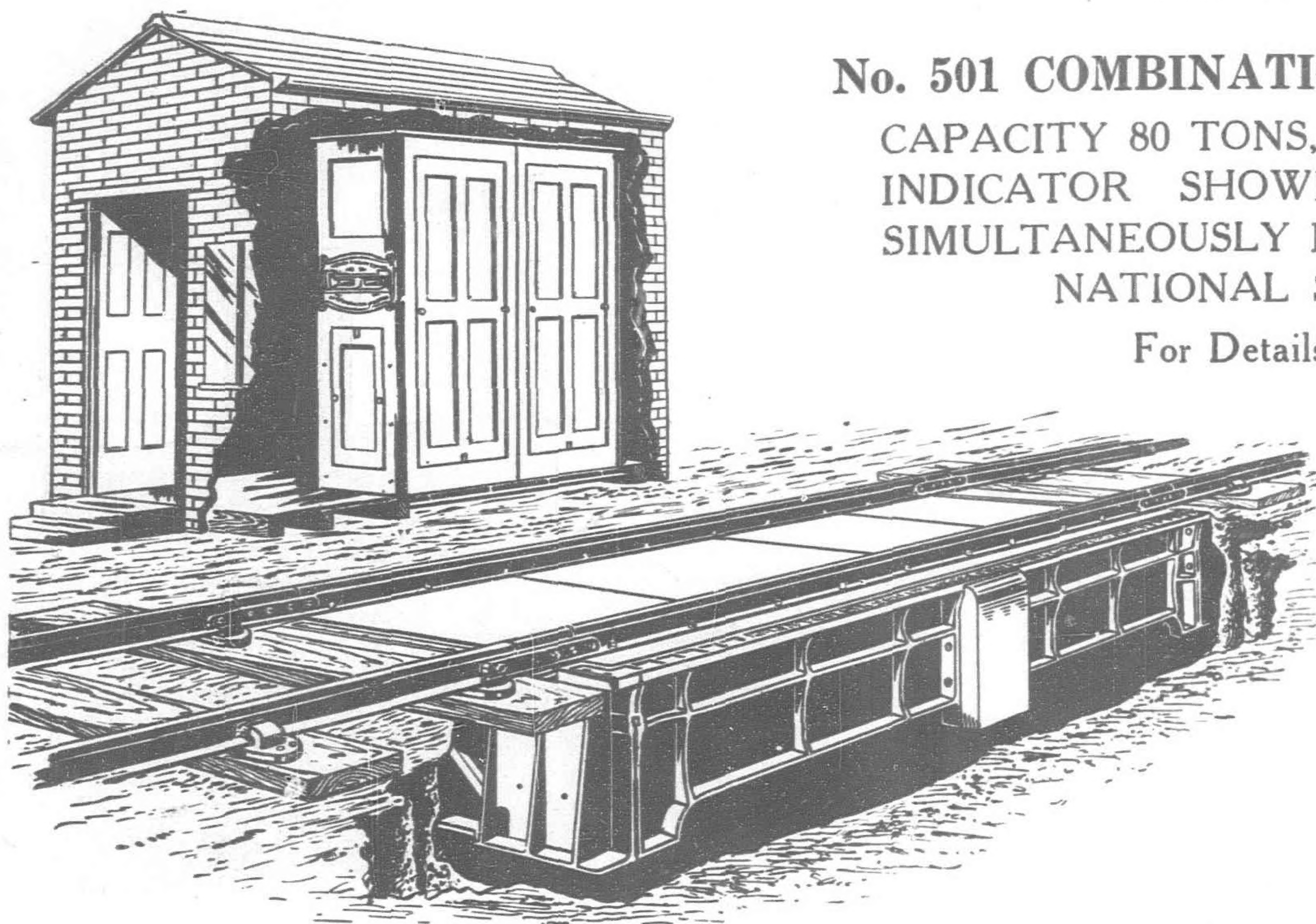
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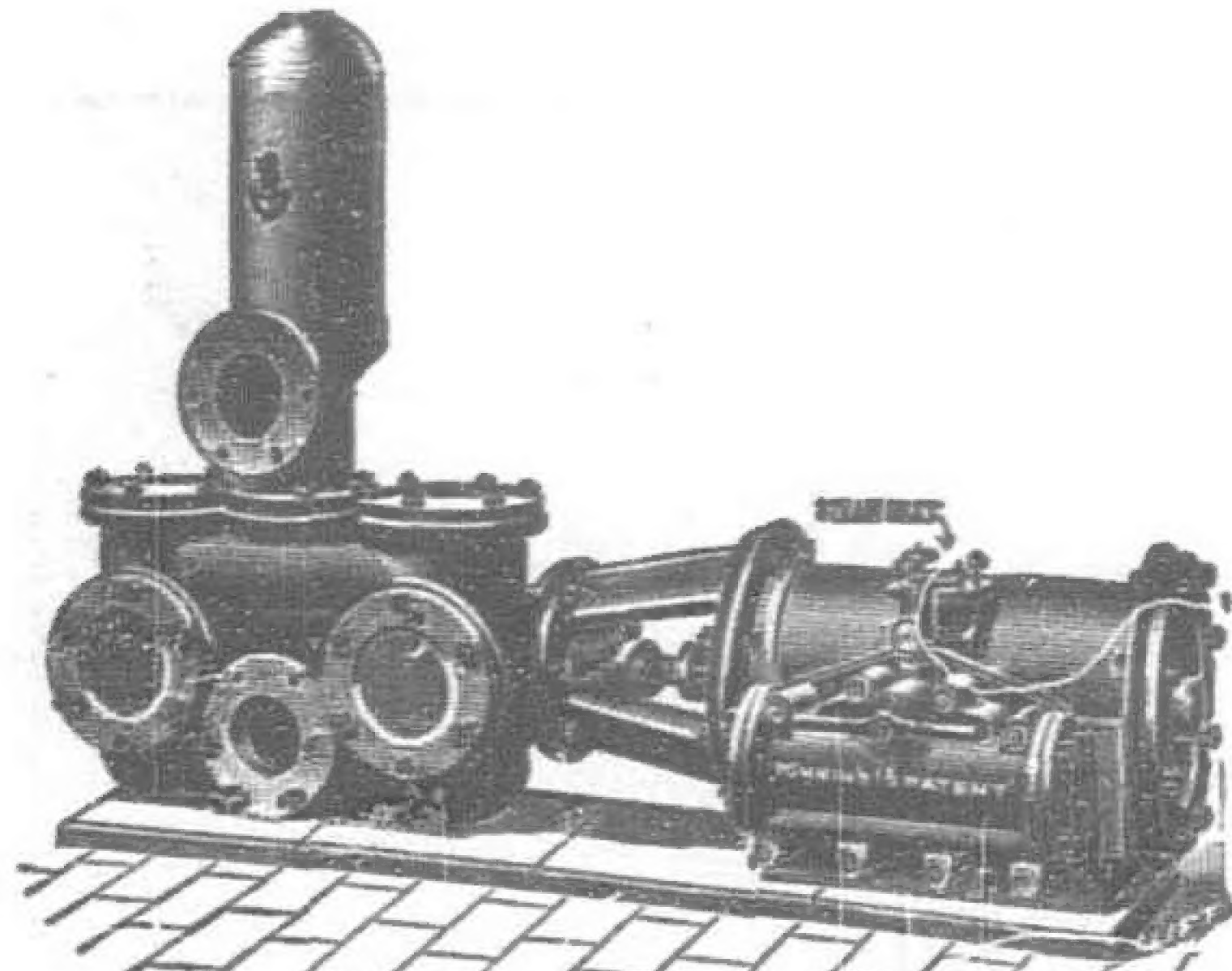


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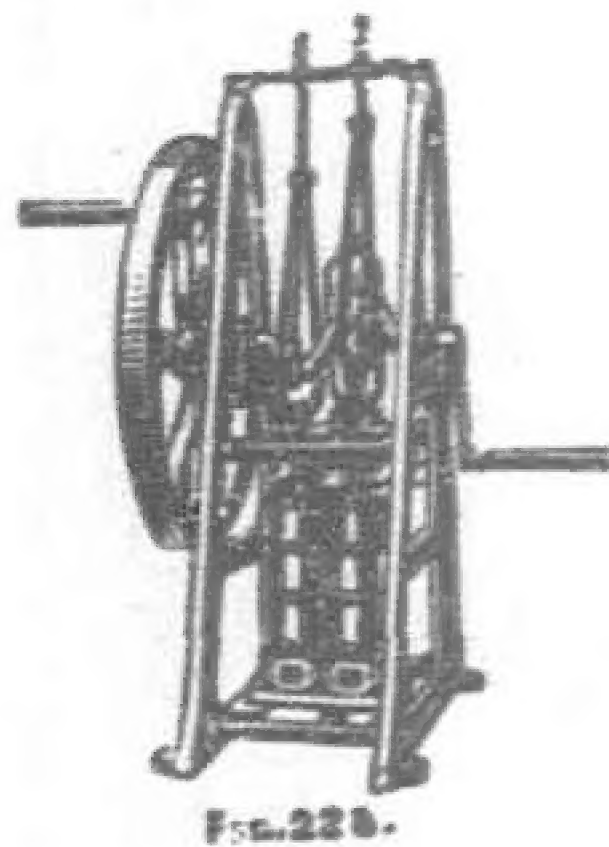
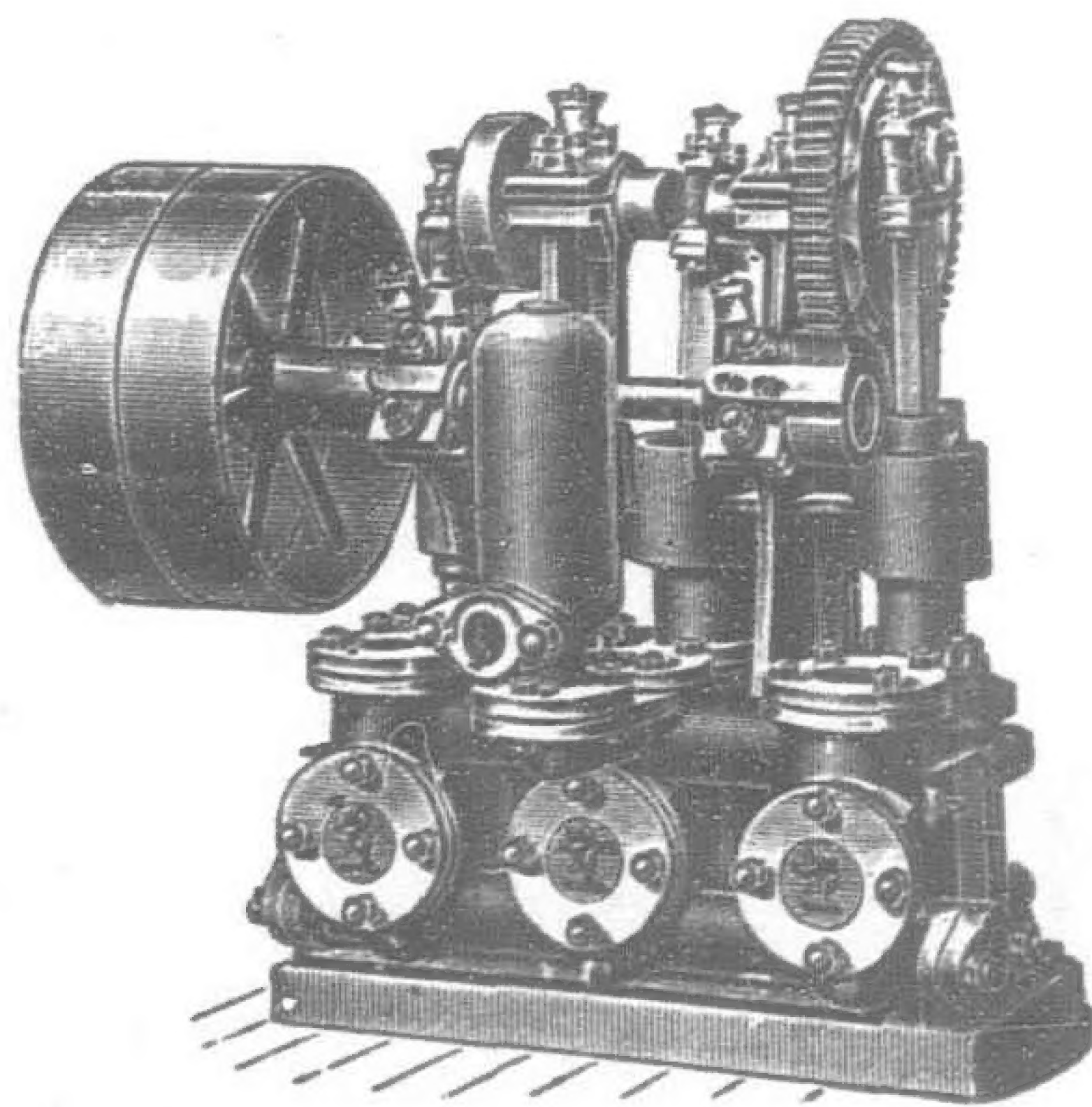
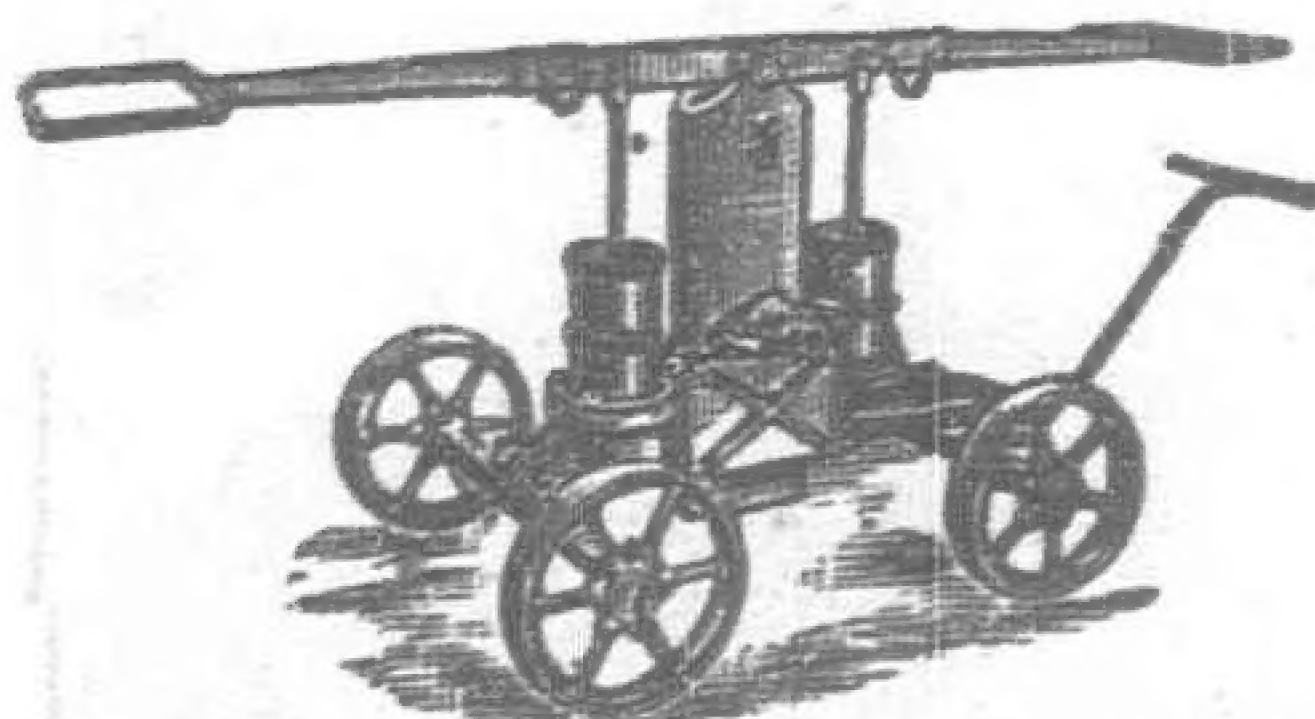


Fig. 220.



Fig. 160.



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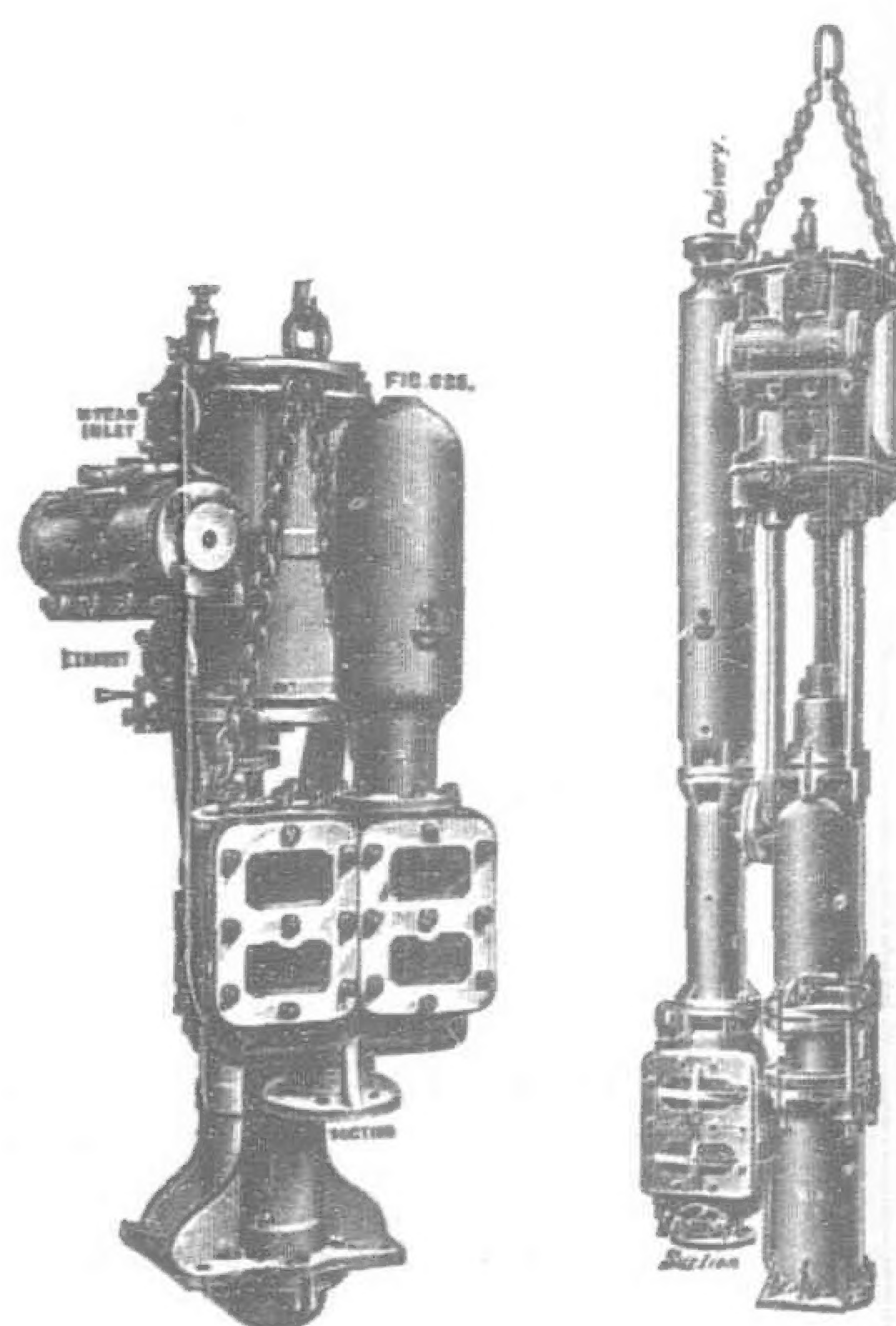
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Fig. 191.



Fig. 185.

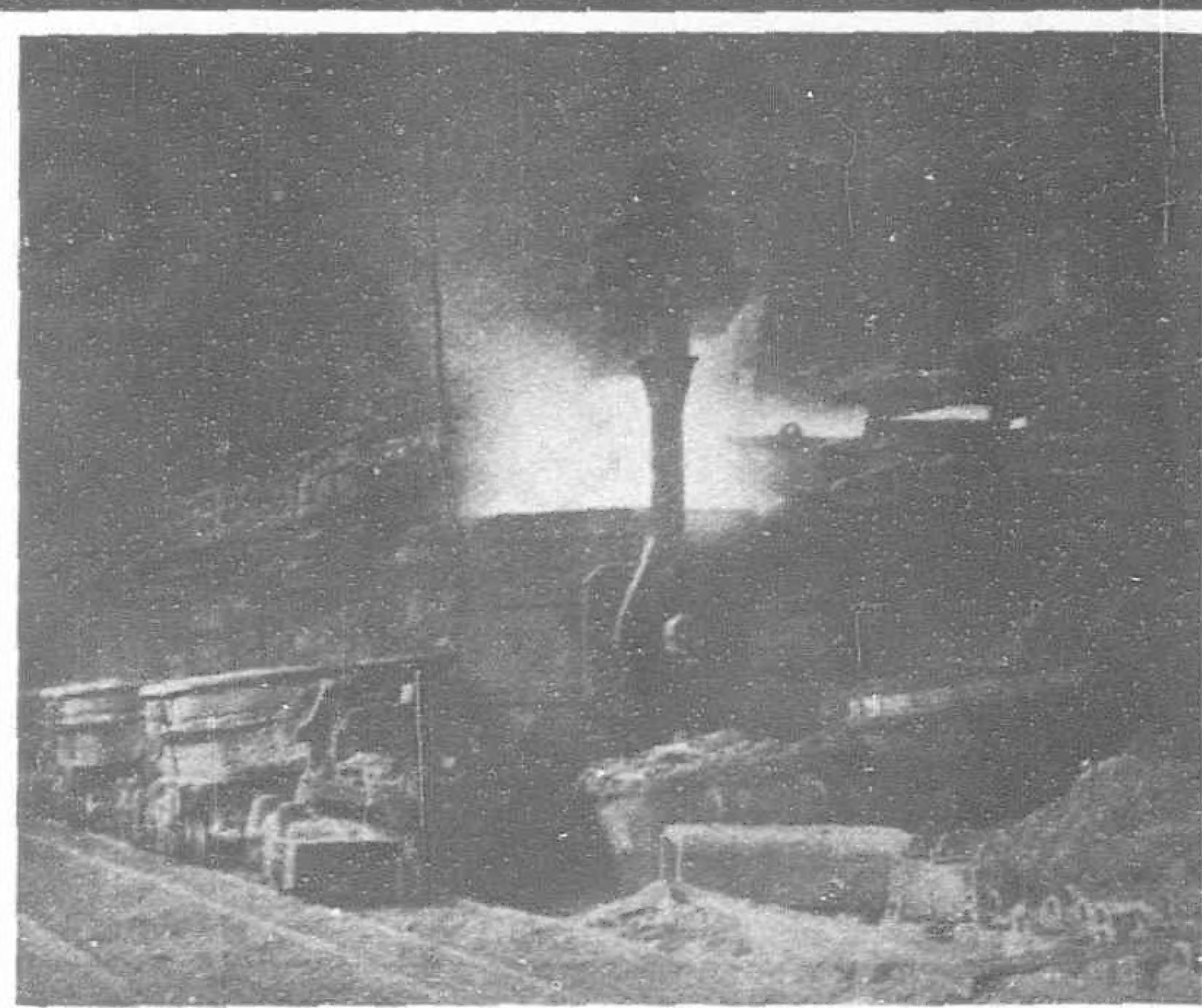


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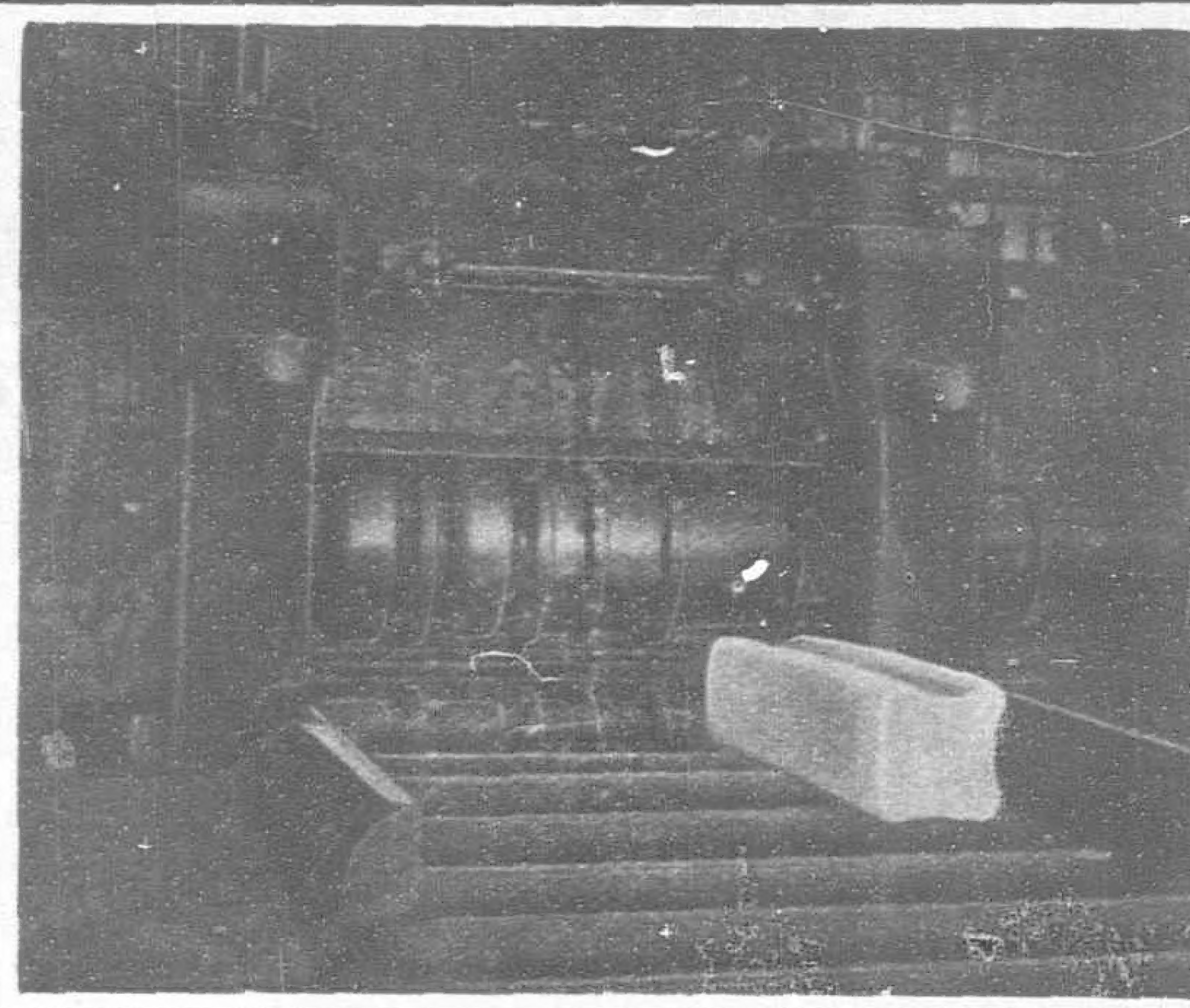


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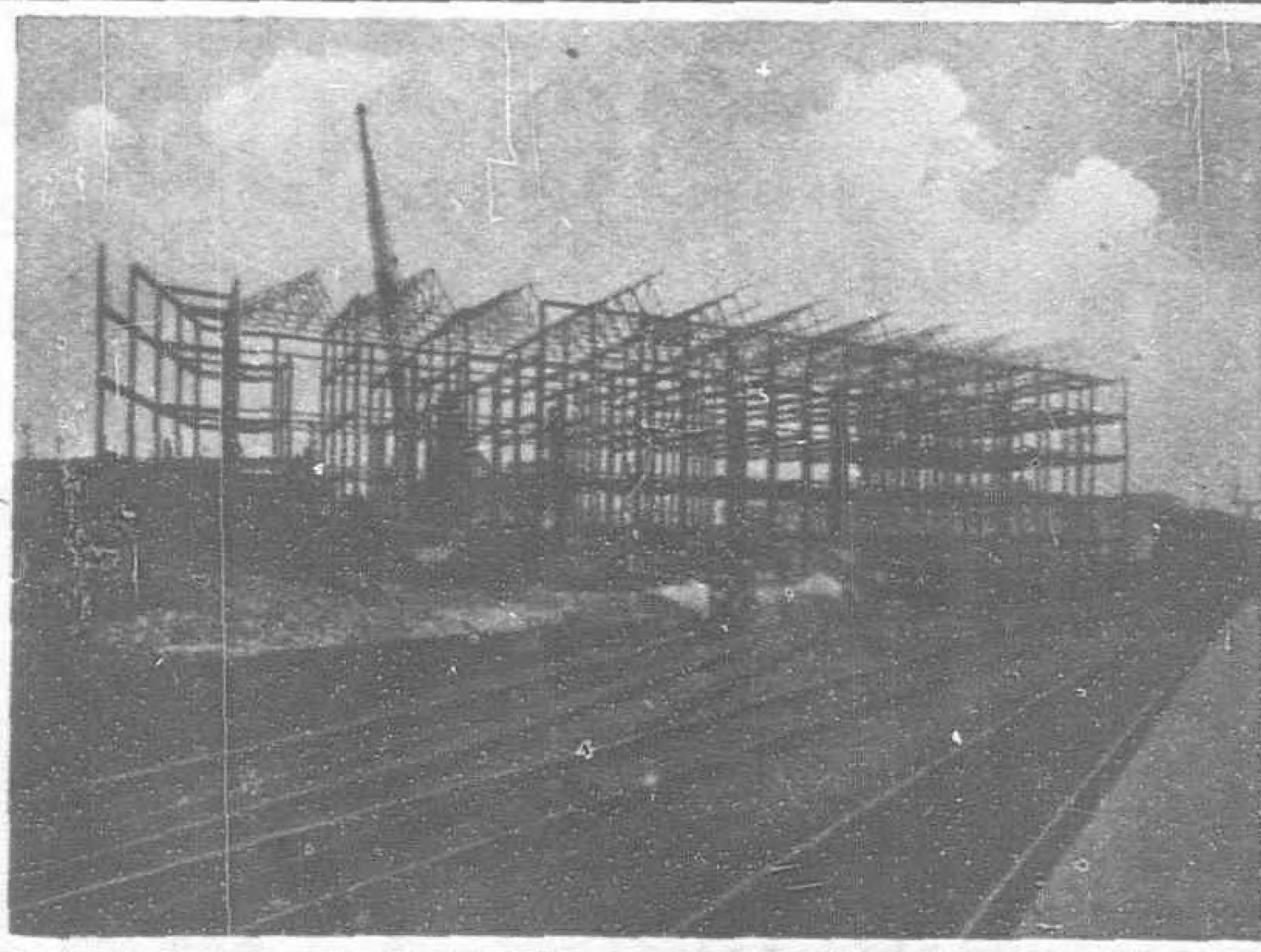


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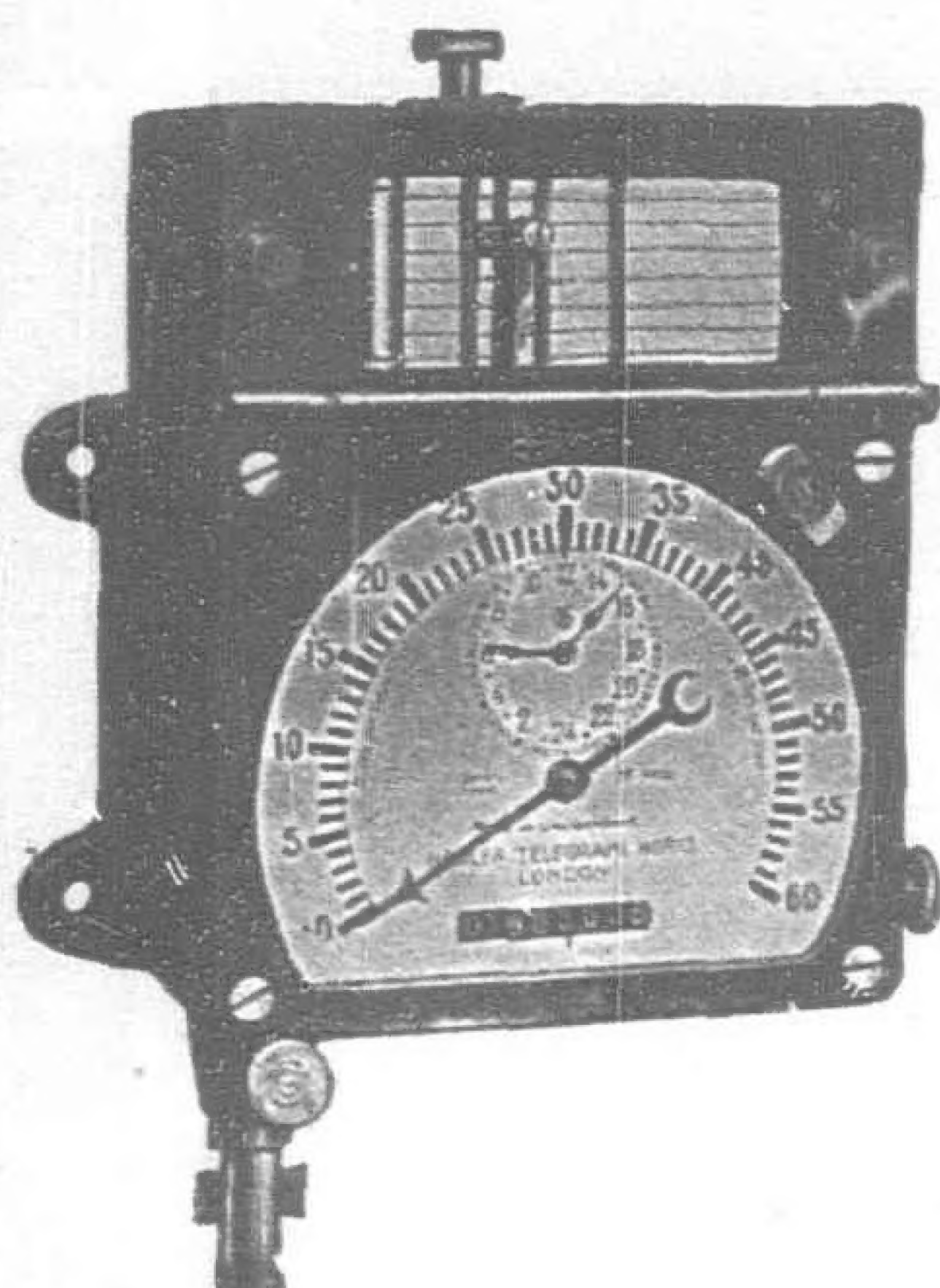
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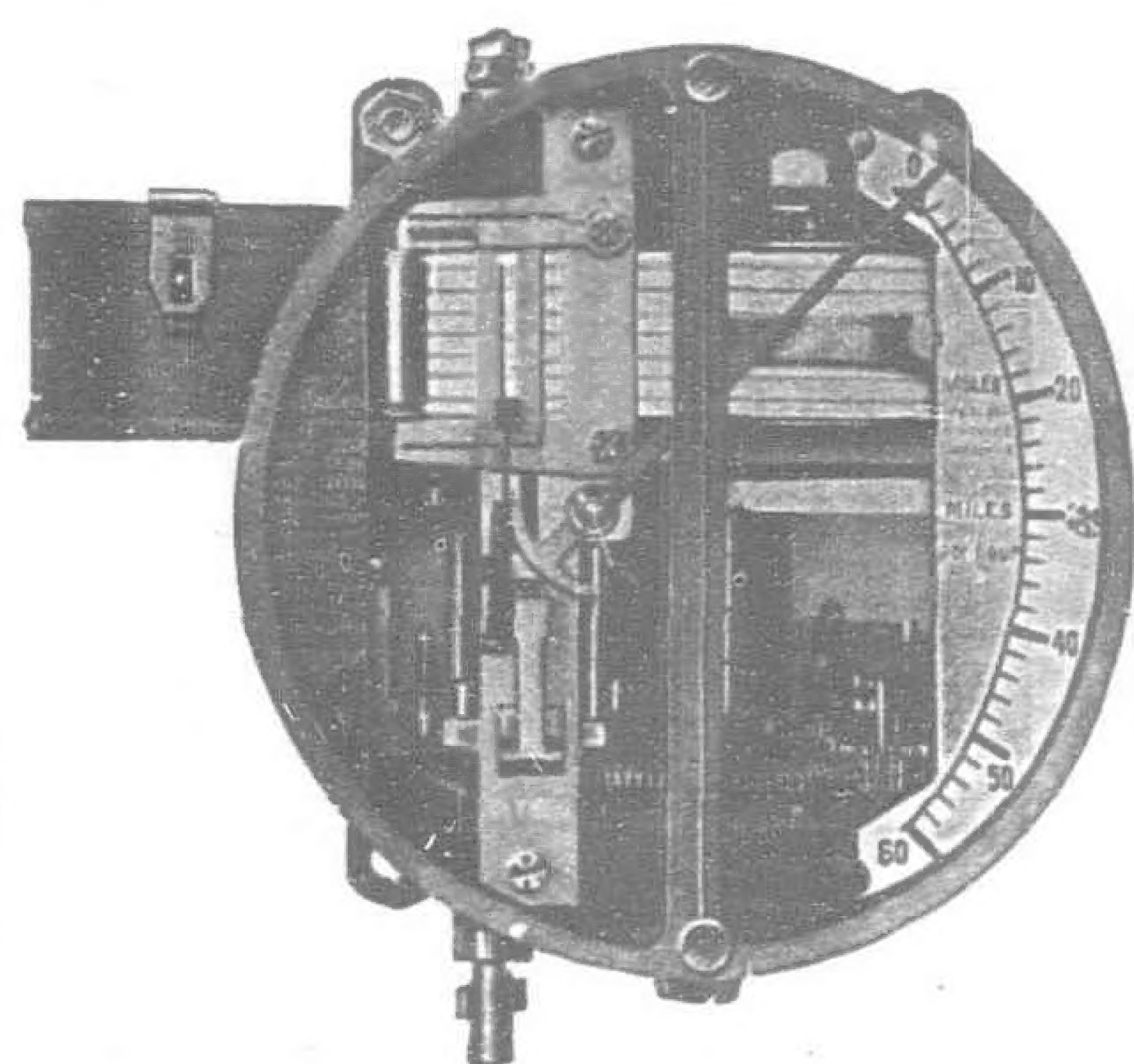
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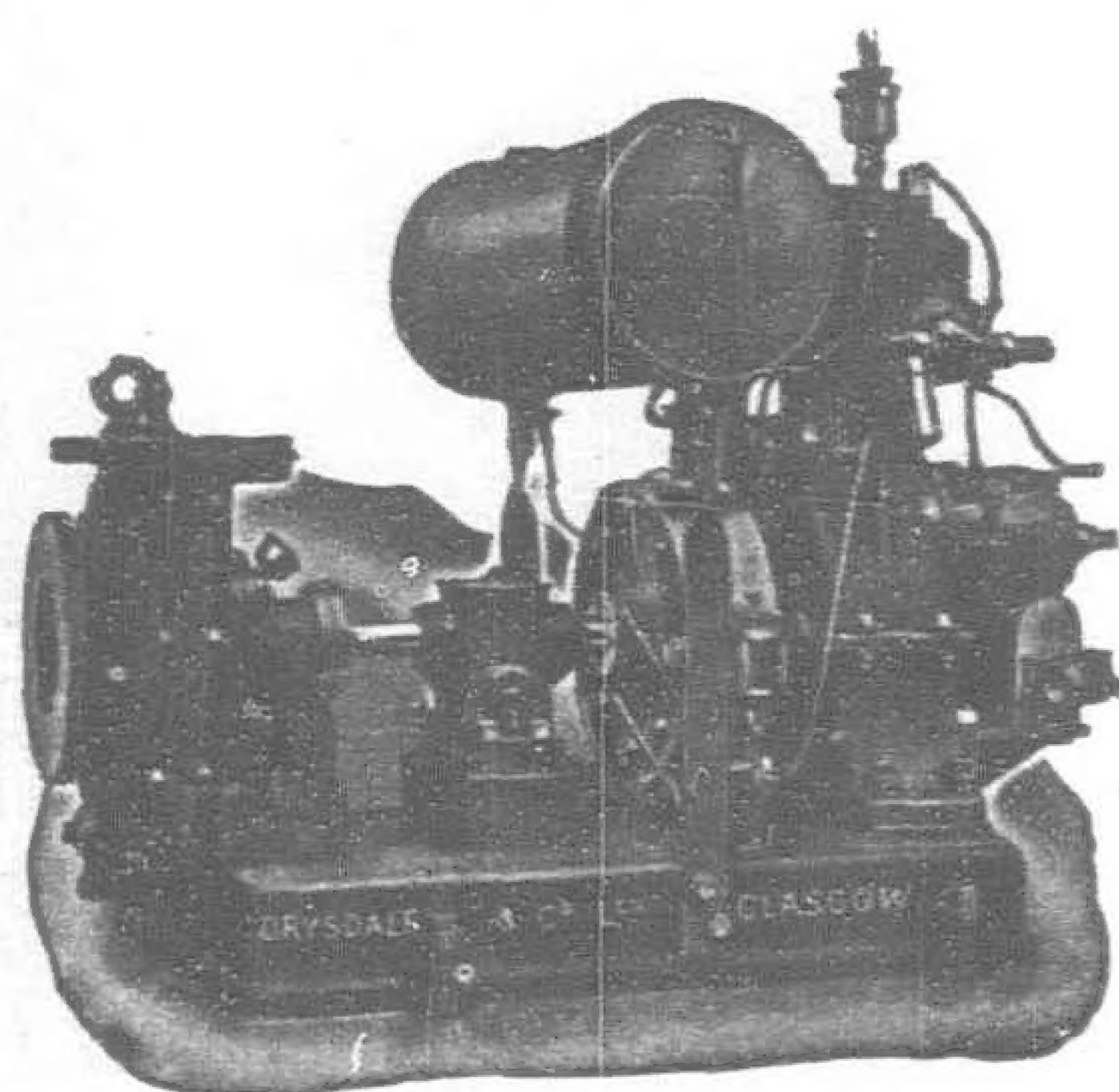
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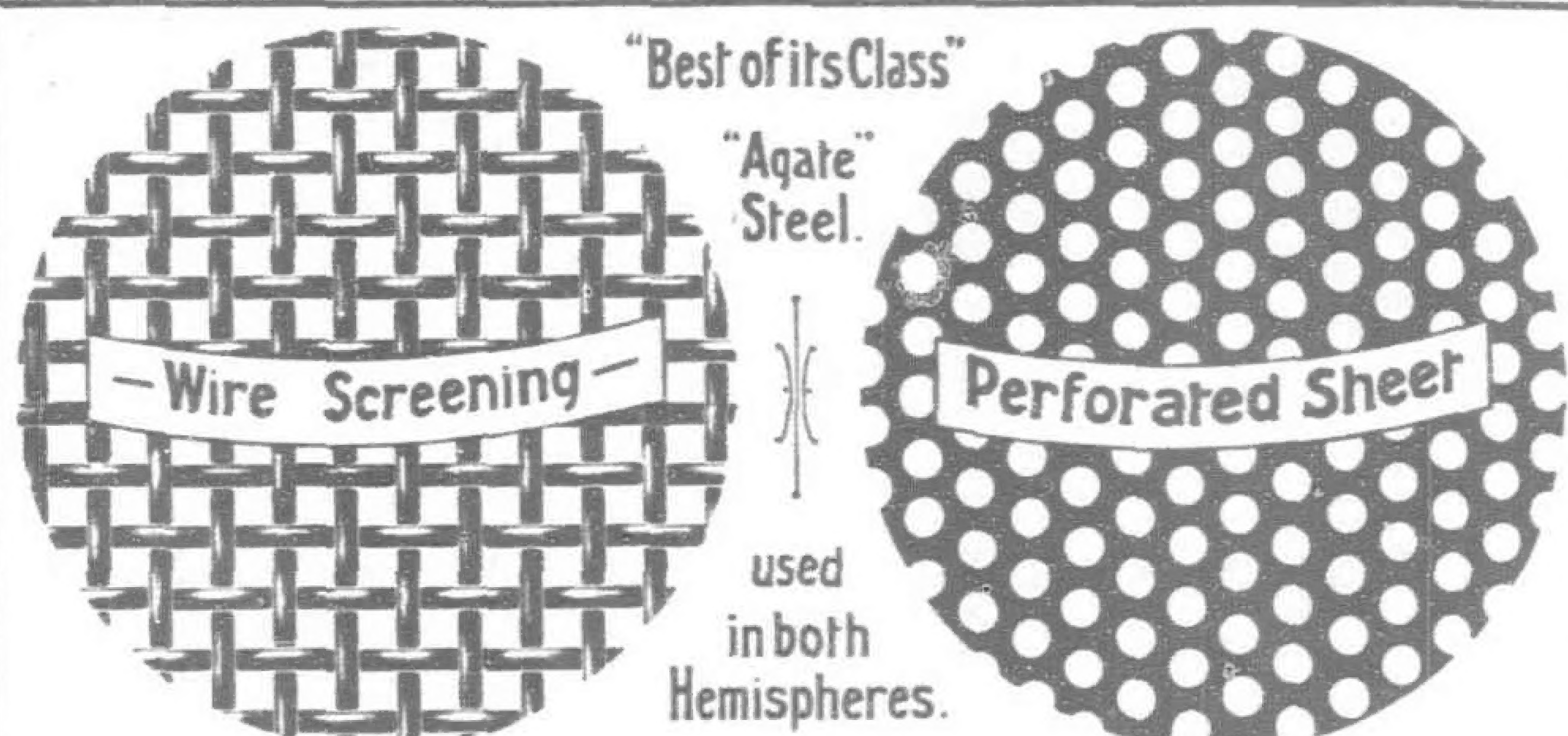
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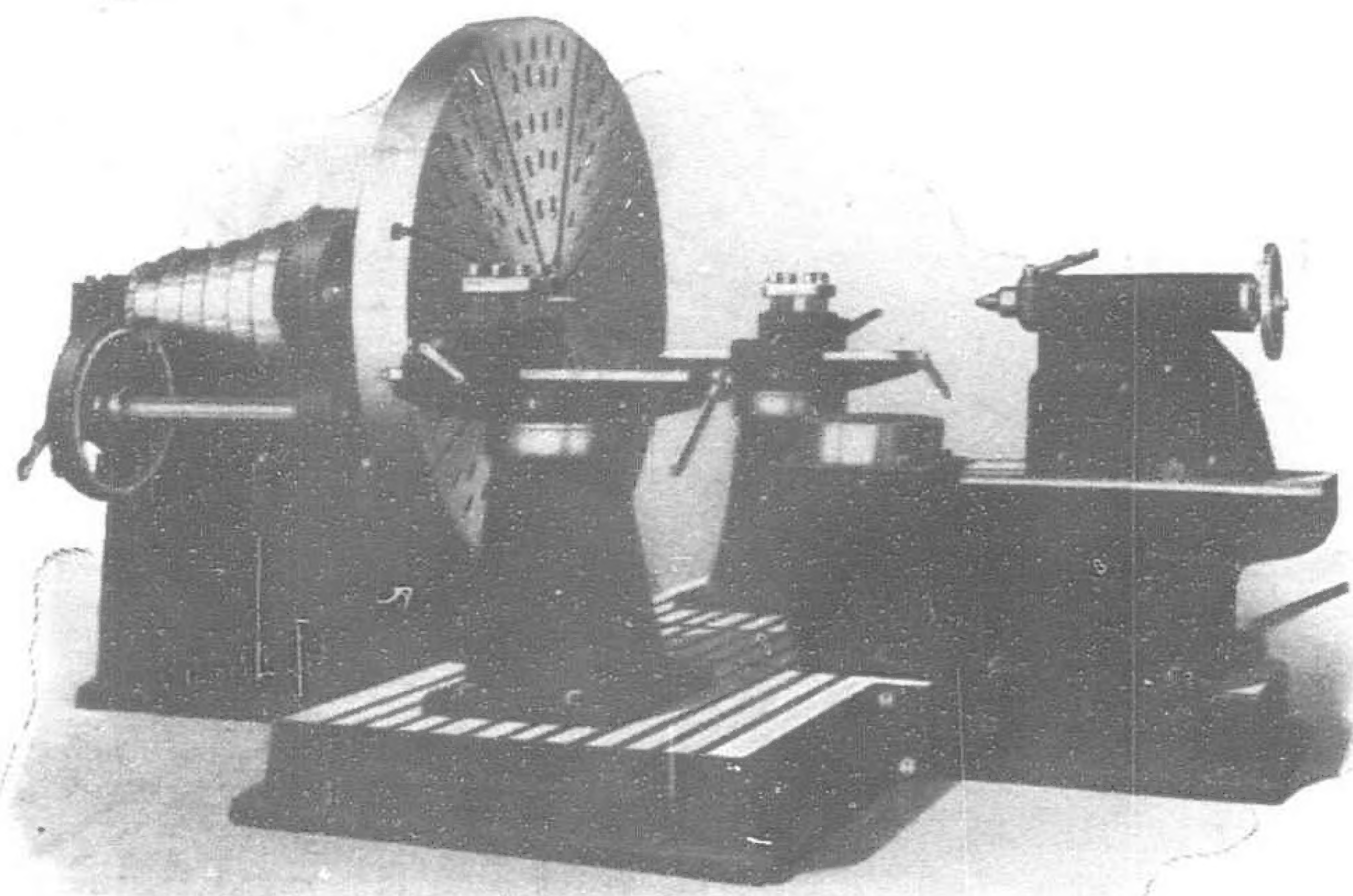
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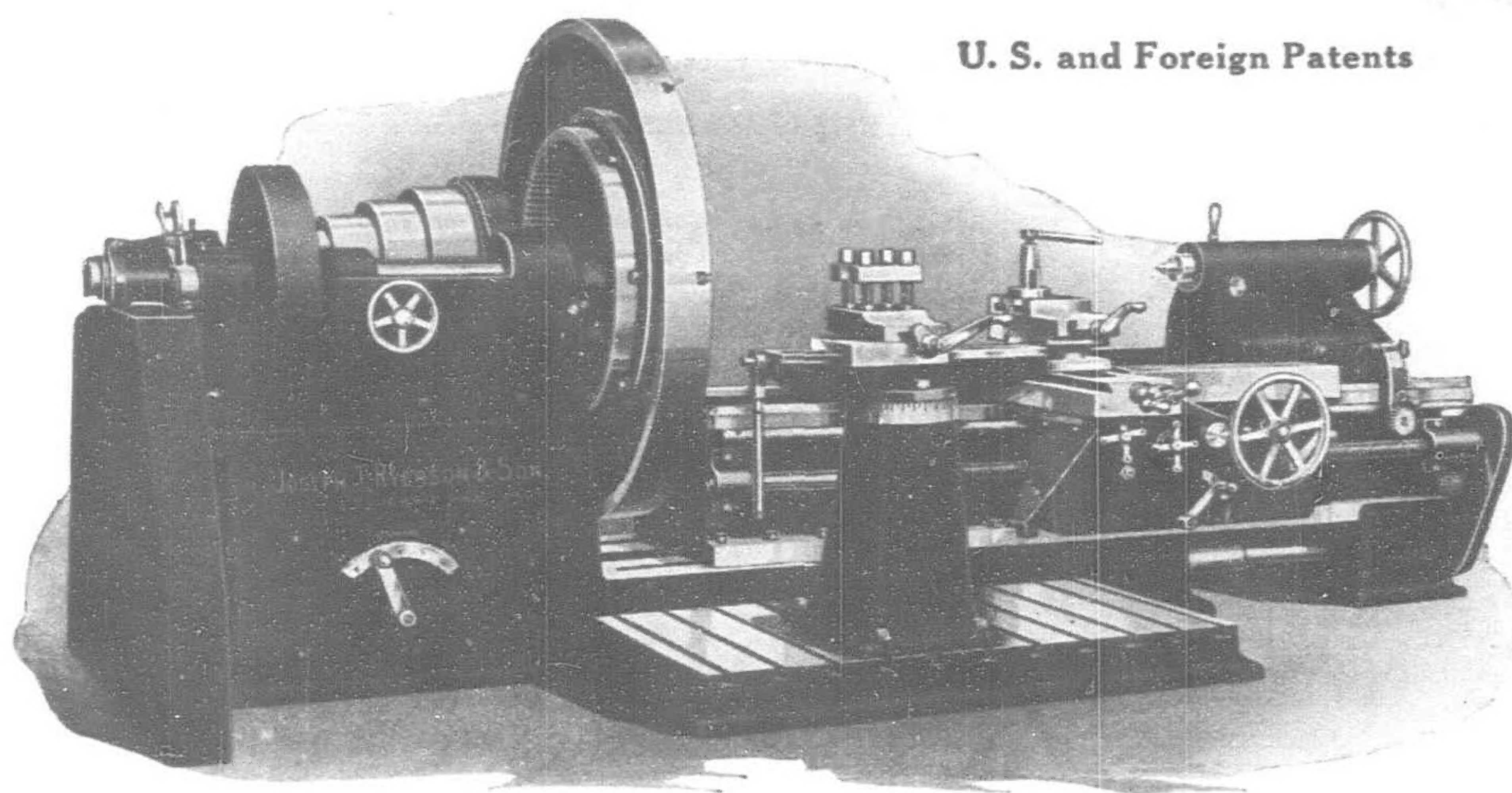
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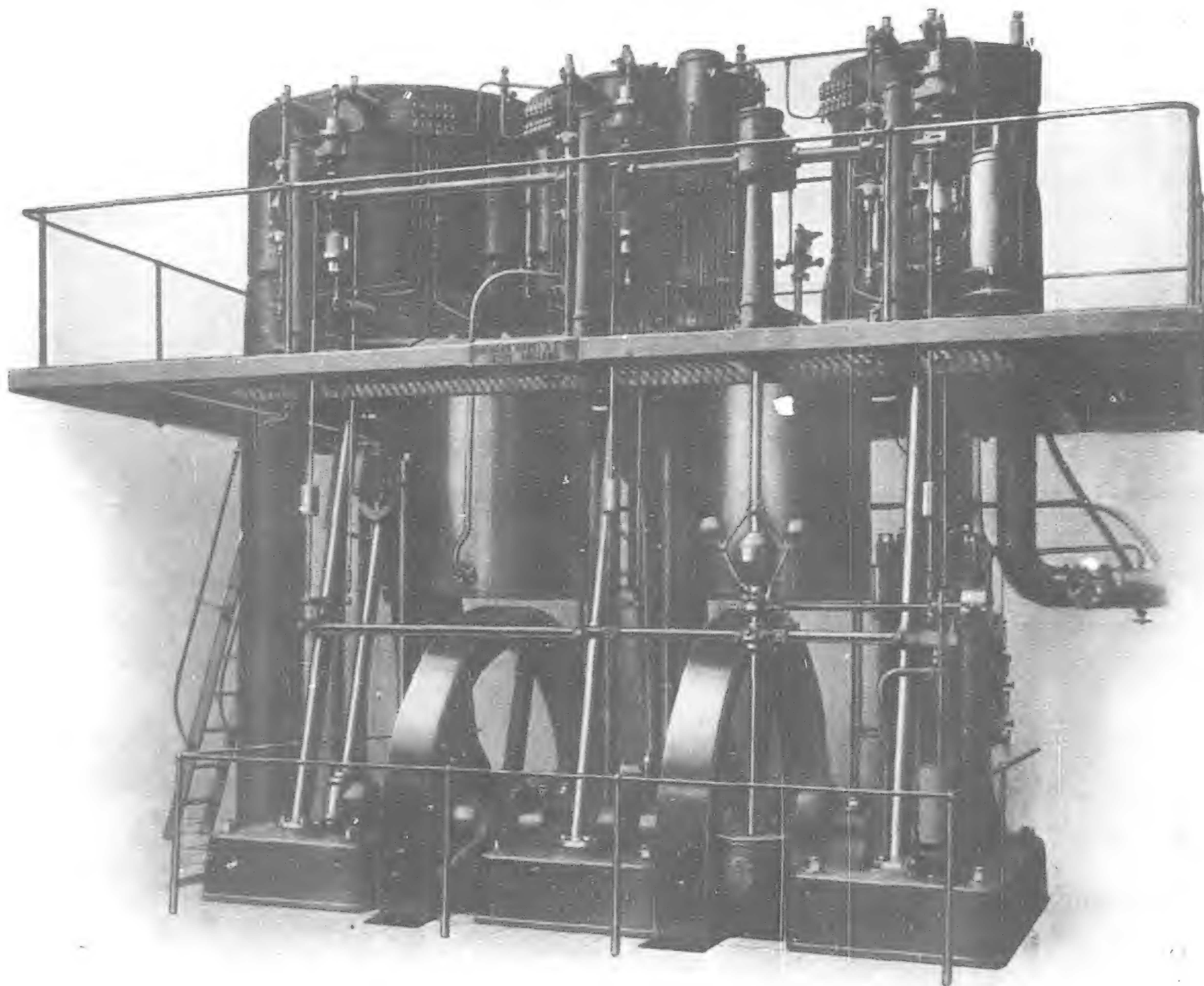
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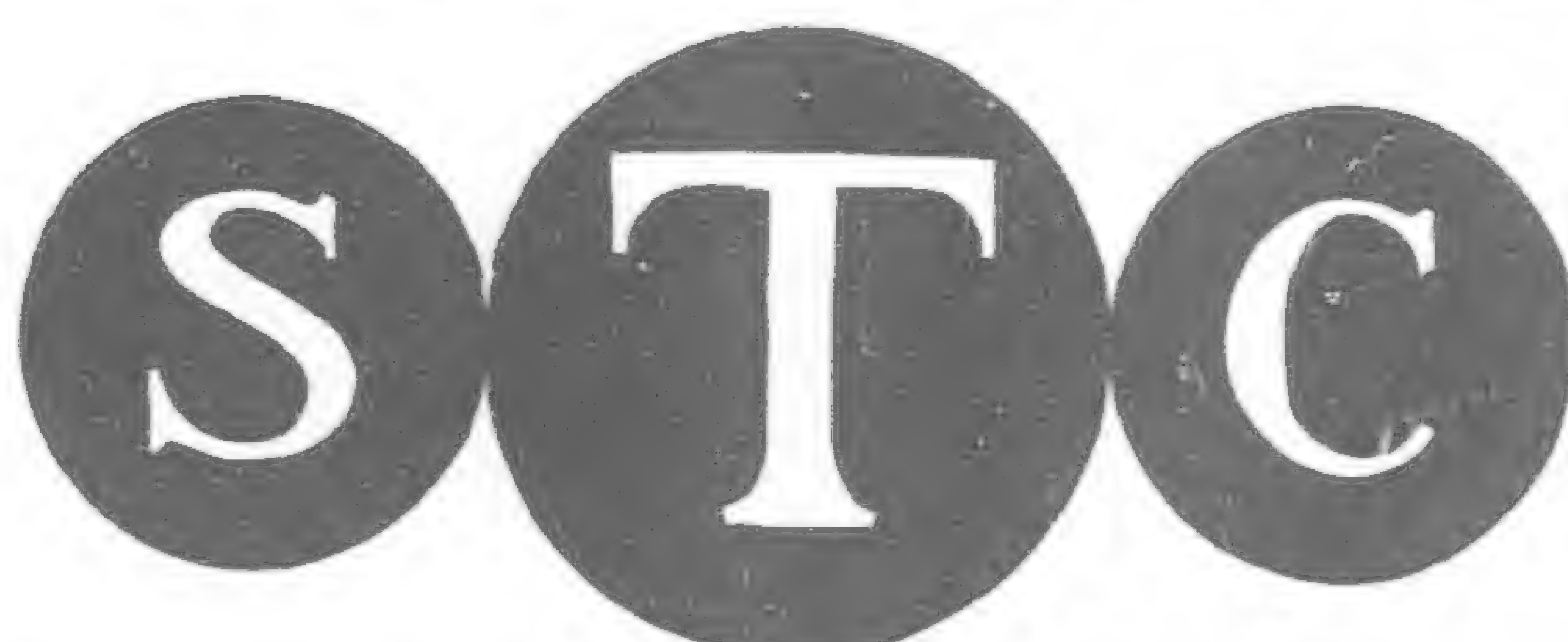
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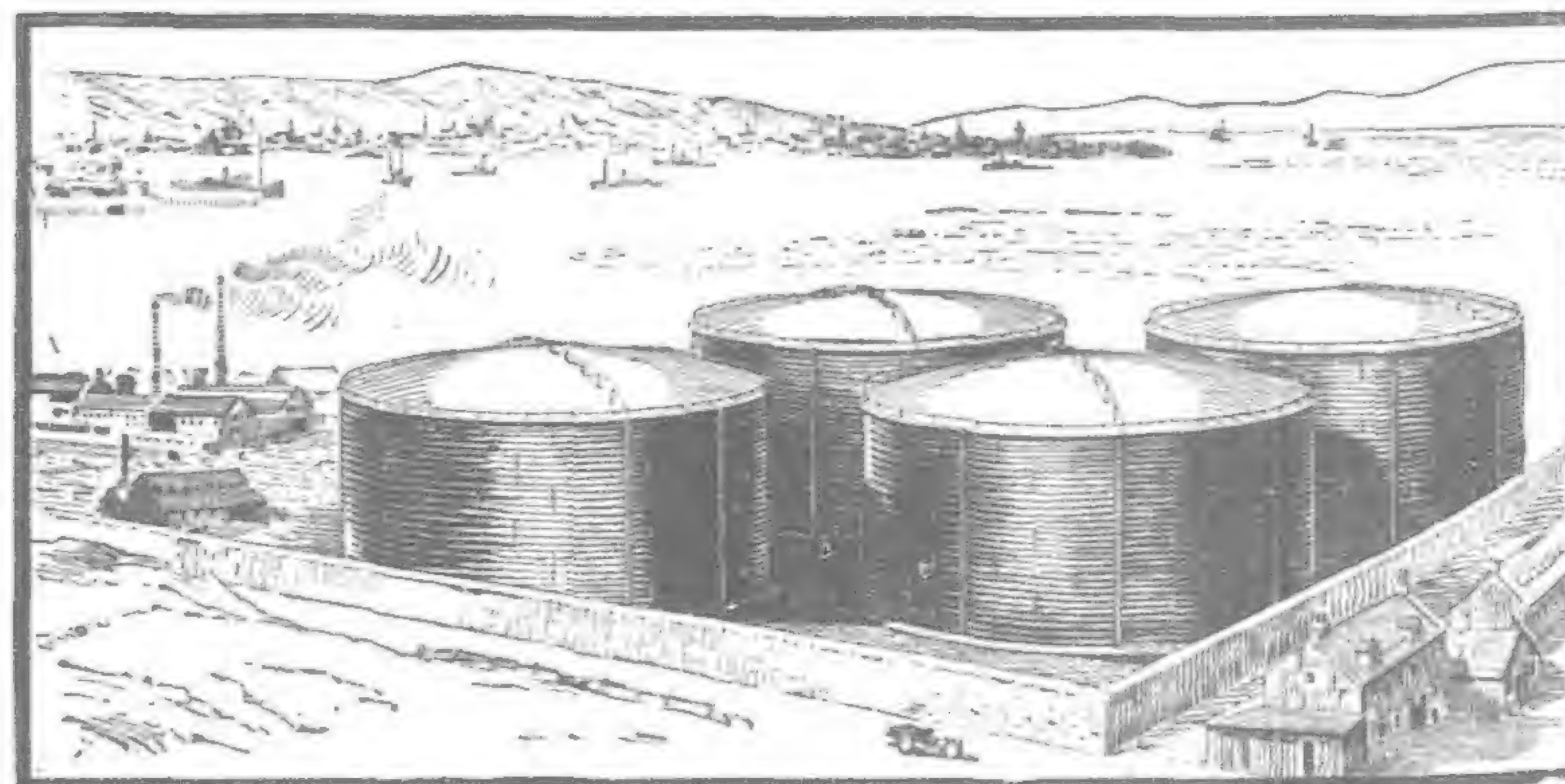
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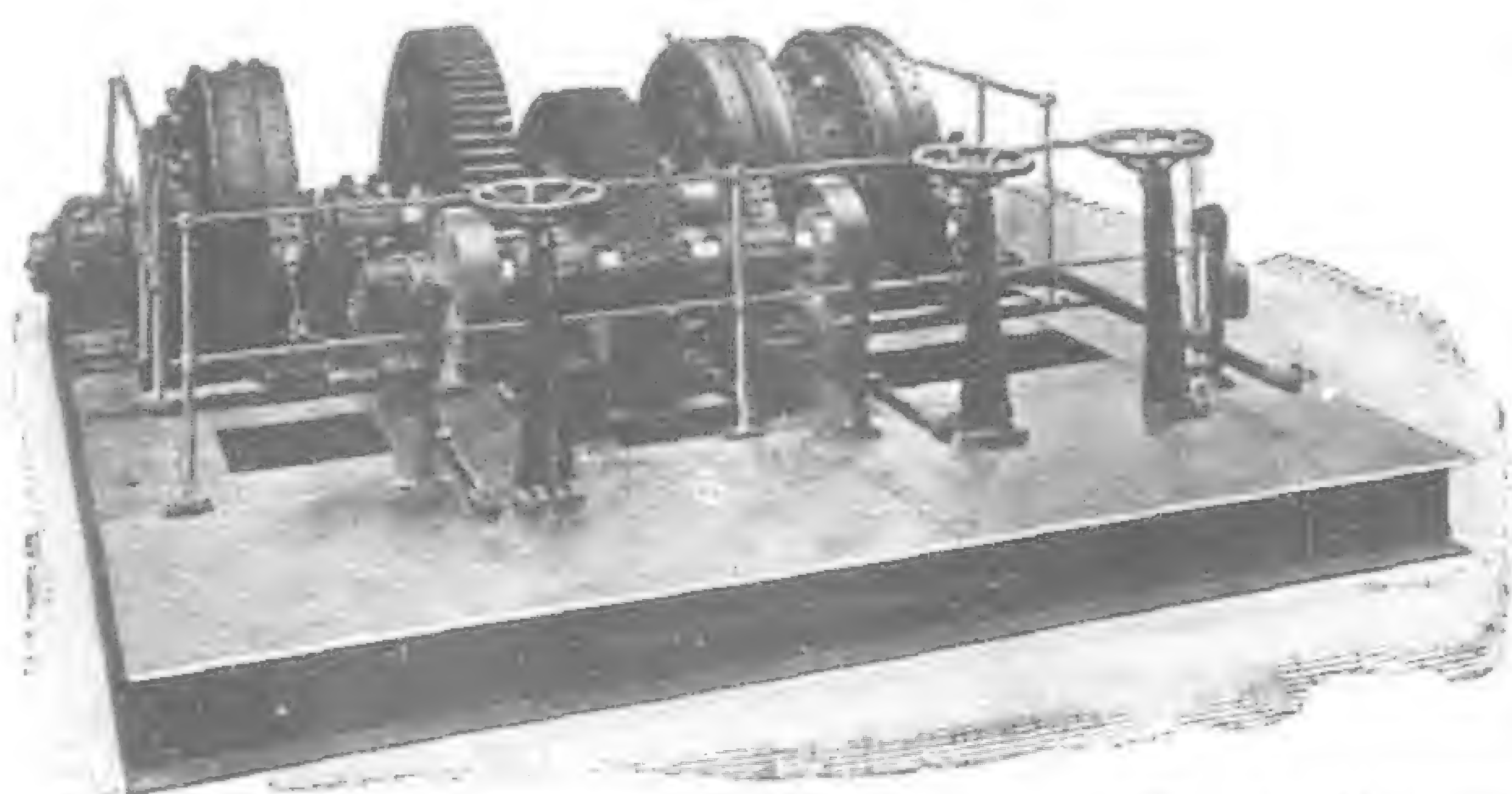
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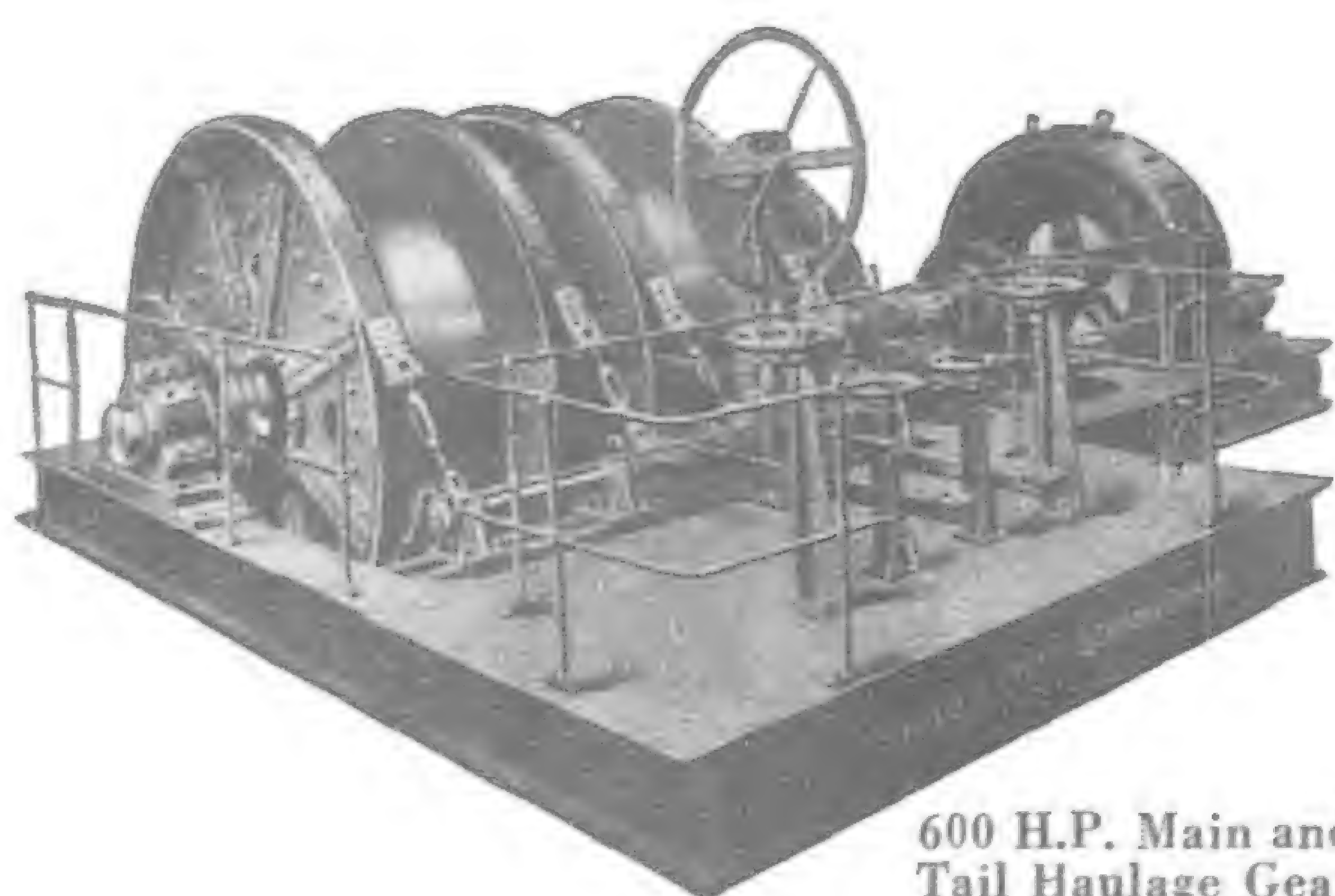
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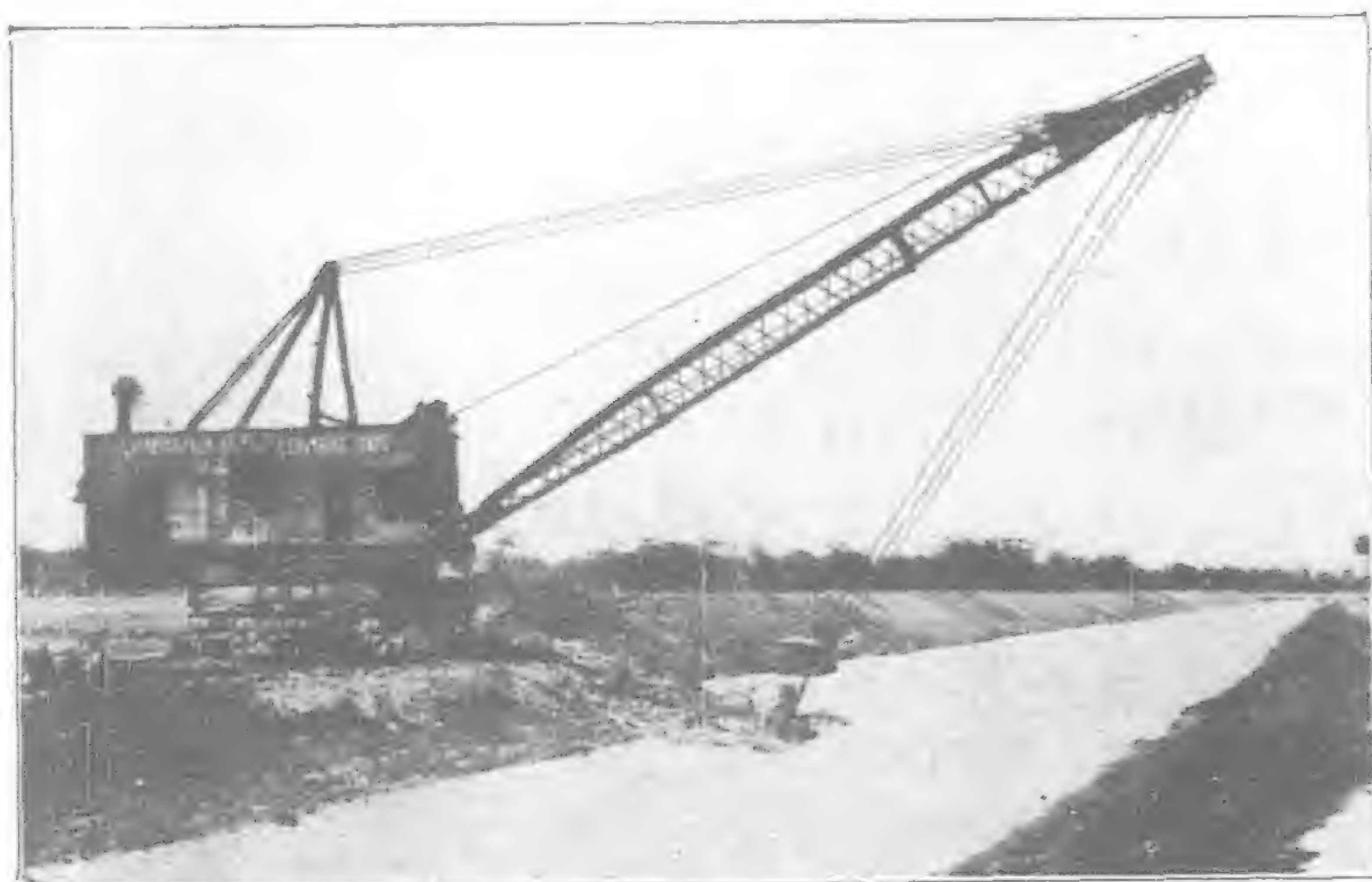
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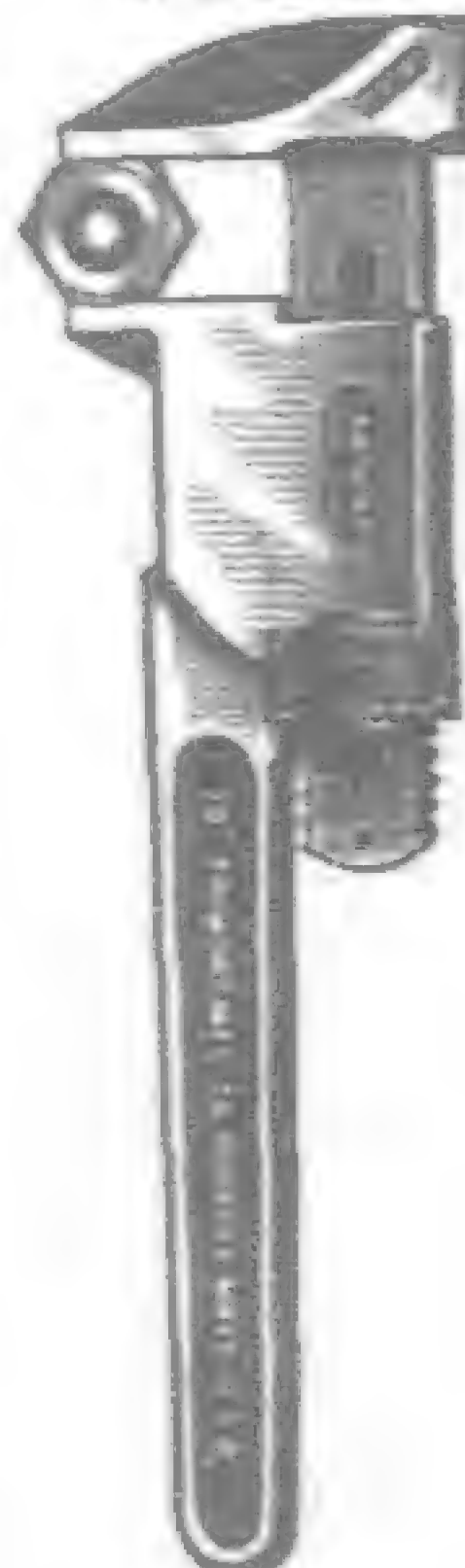
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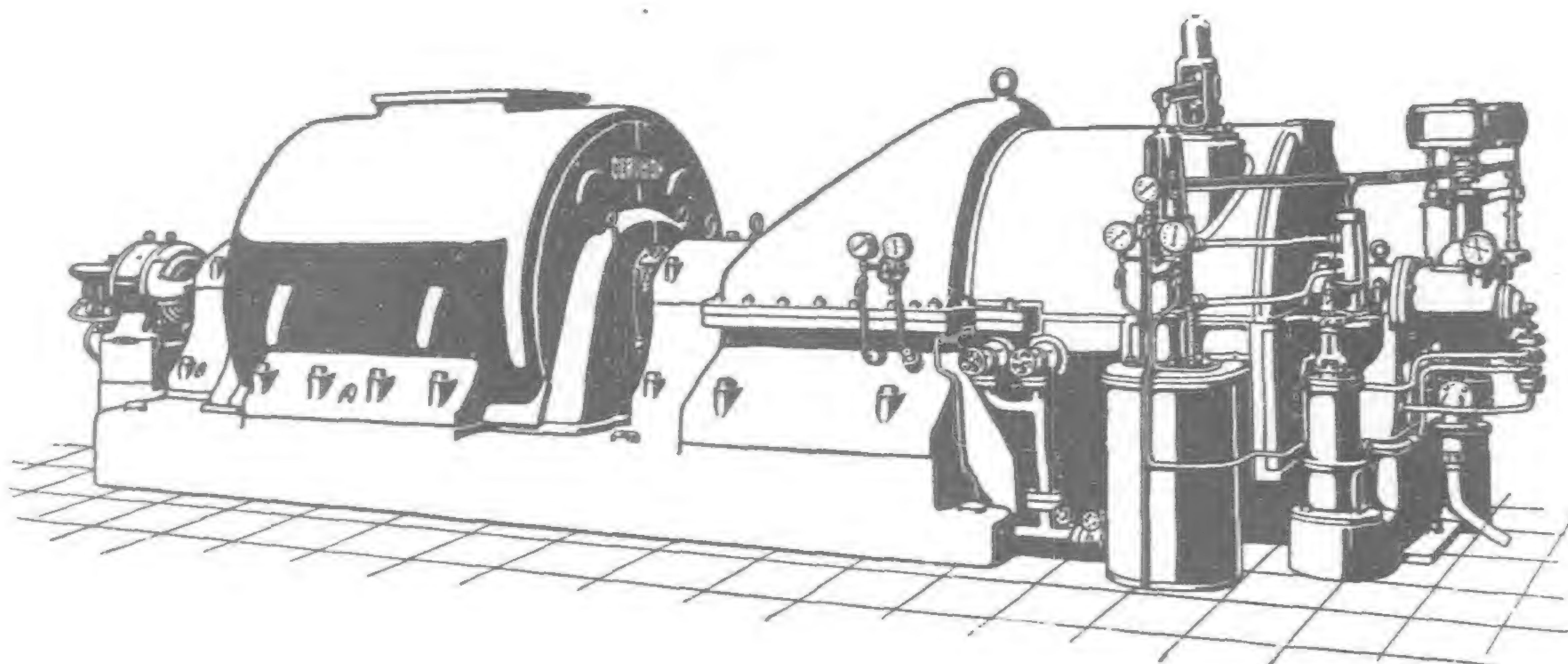
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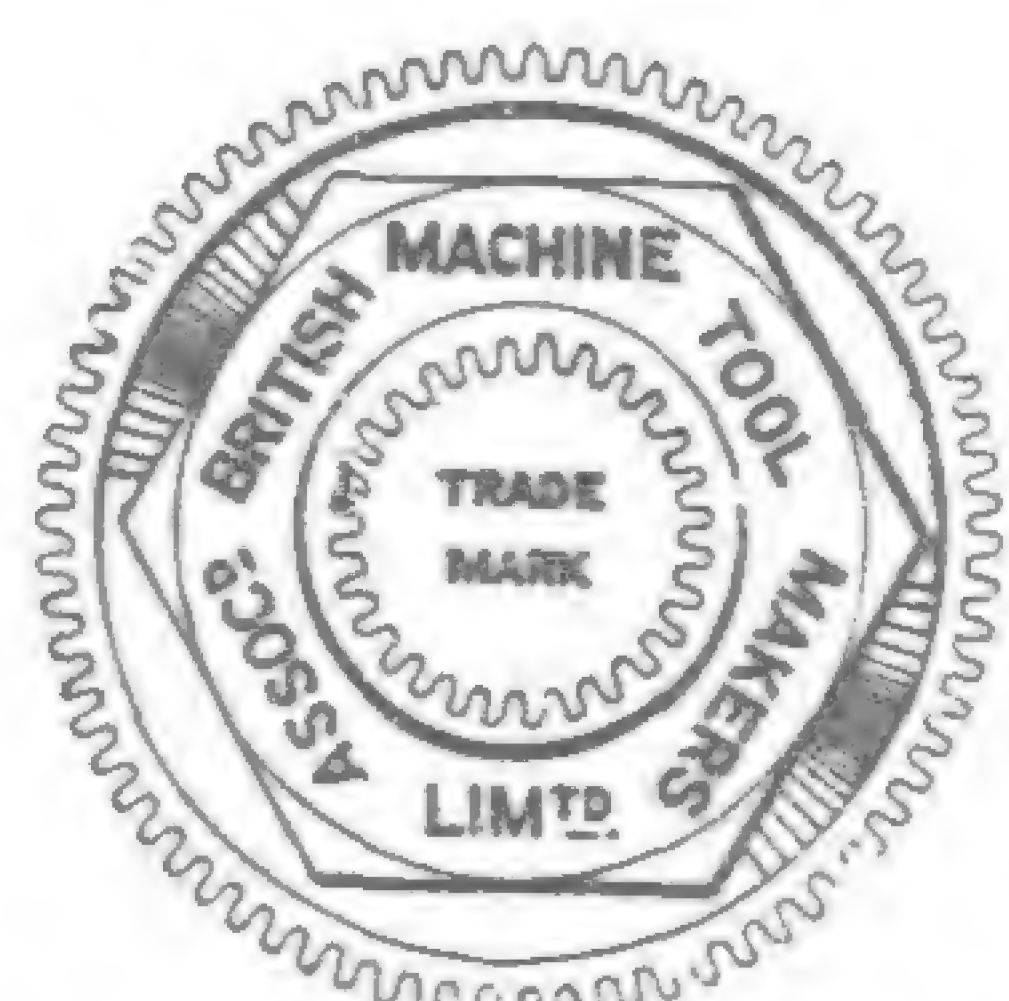
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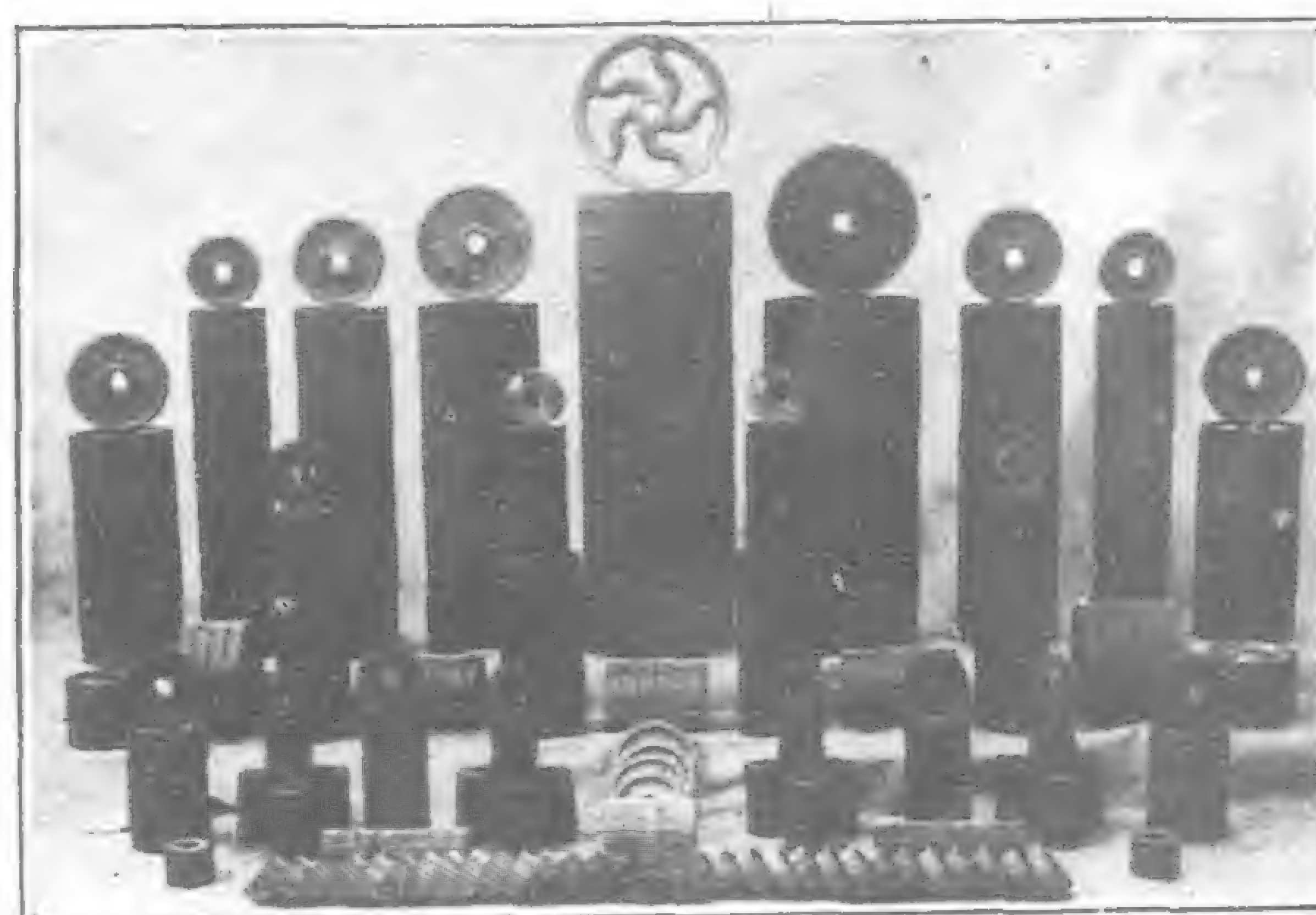
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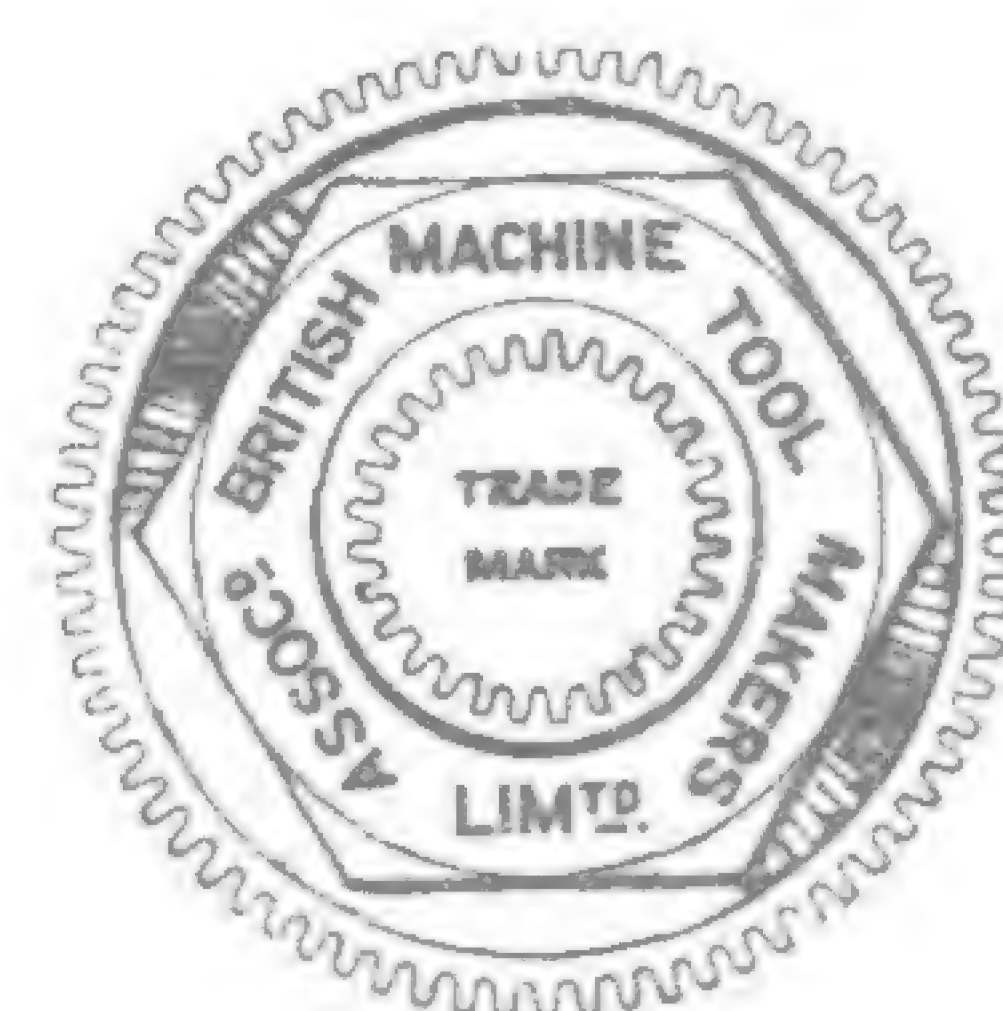
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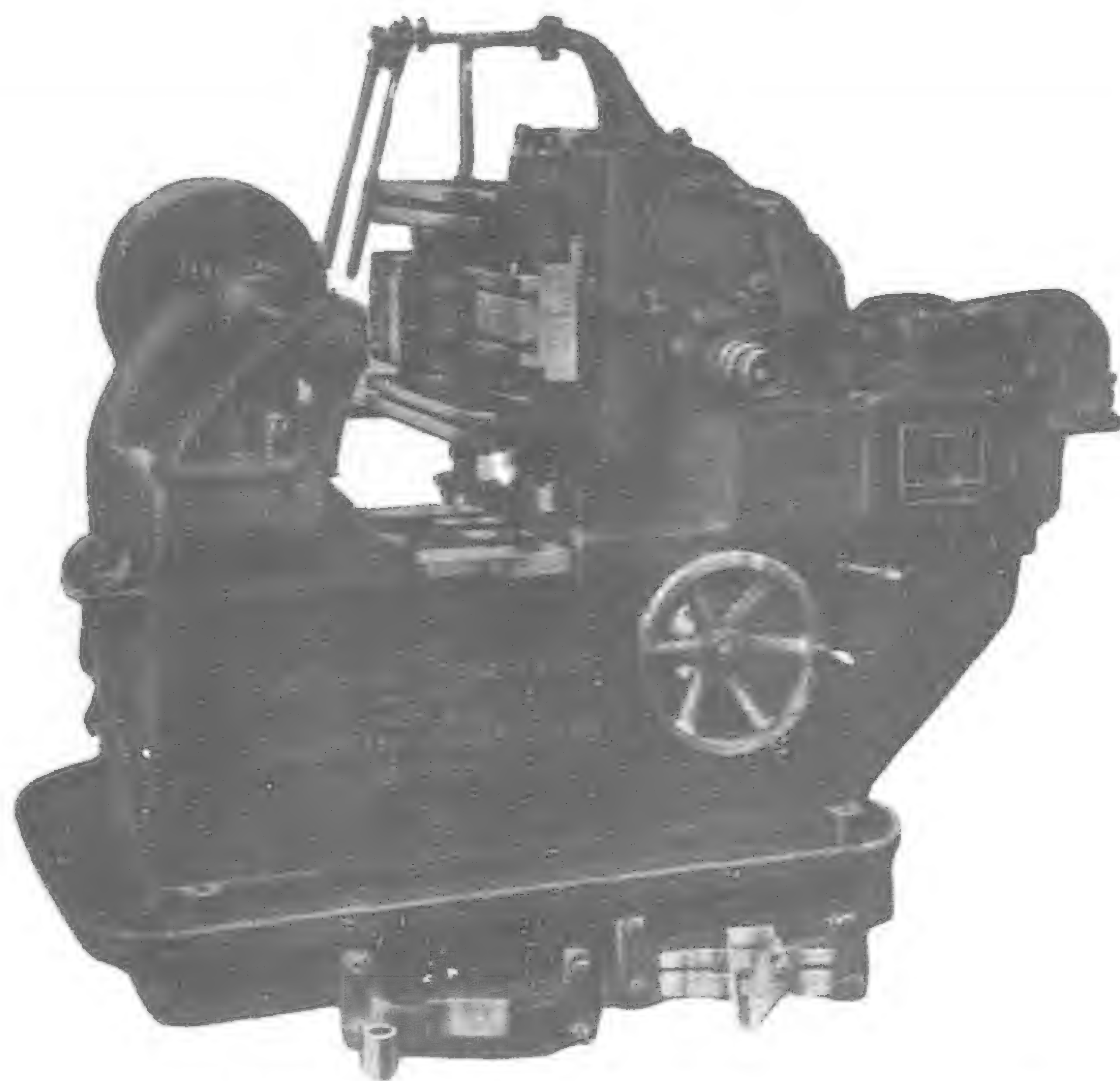
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98	30	2,940	3 " "
76	30	2,280	2.4 " "
67	10	670	2.2 " "
63	60	3,780	2 " "
59	30	1,770	2 " "
50	10	500	1.7 " "
47	70	3,290	1.7 " "
42	60	2,520	1.7 " "
40	10	400	1.7 " "
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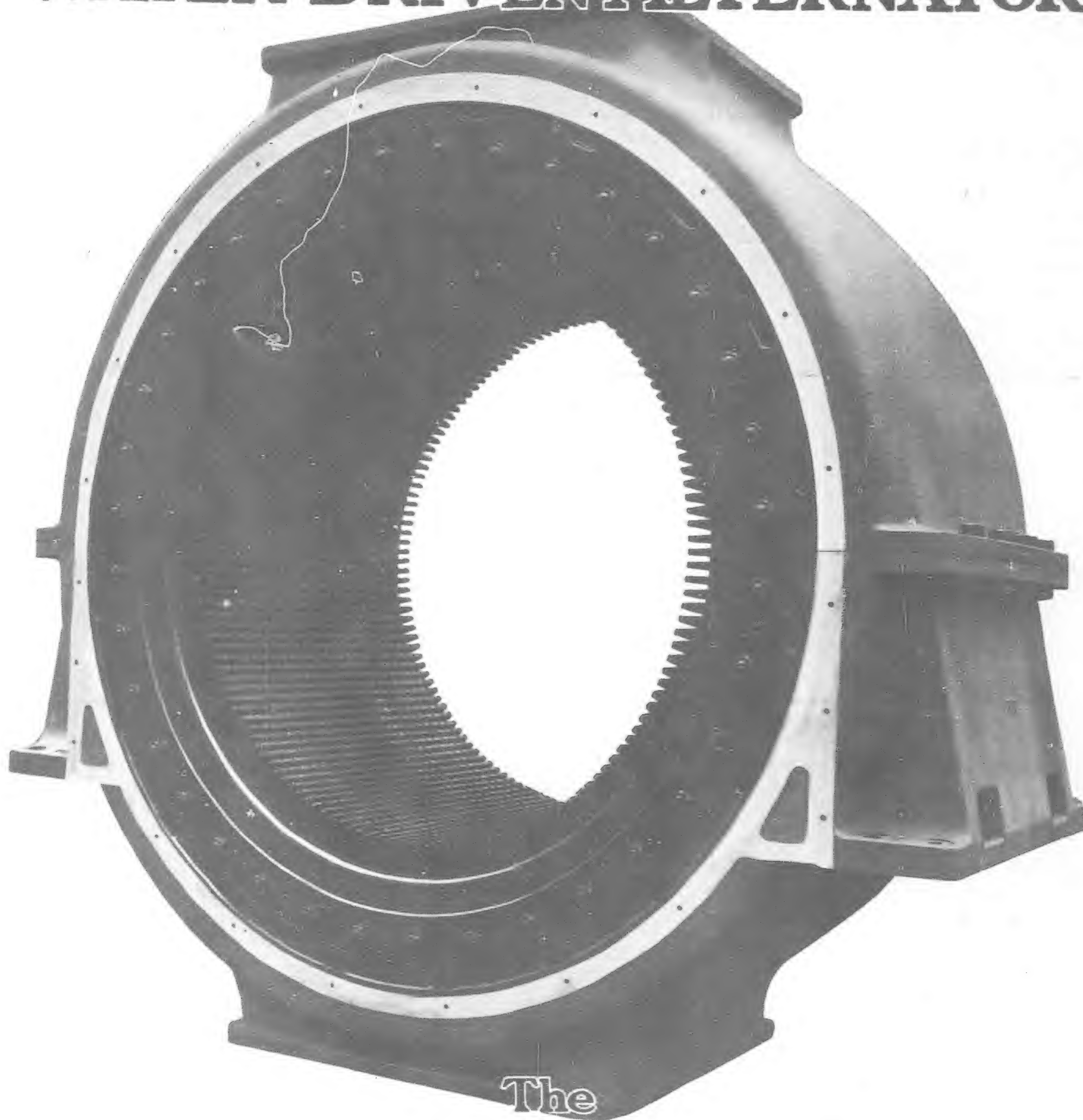
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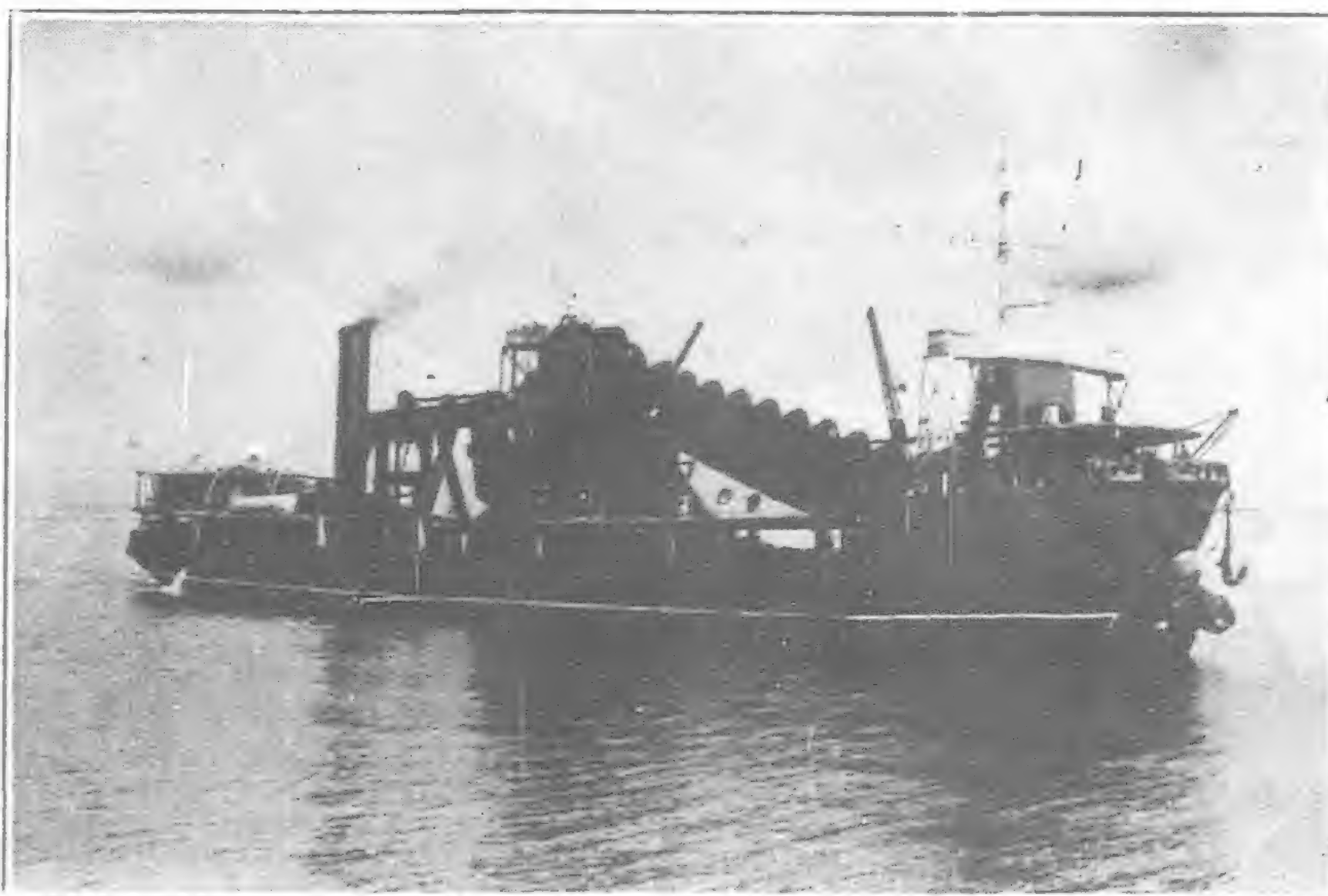
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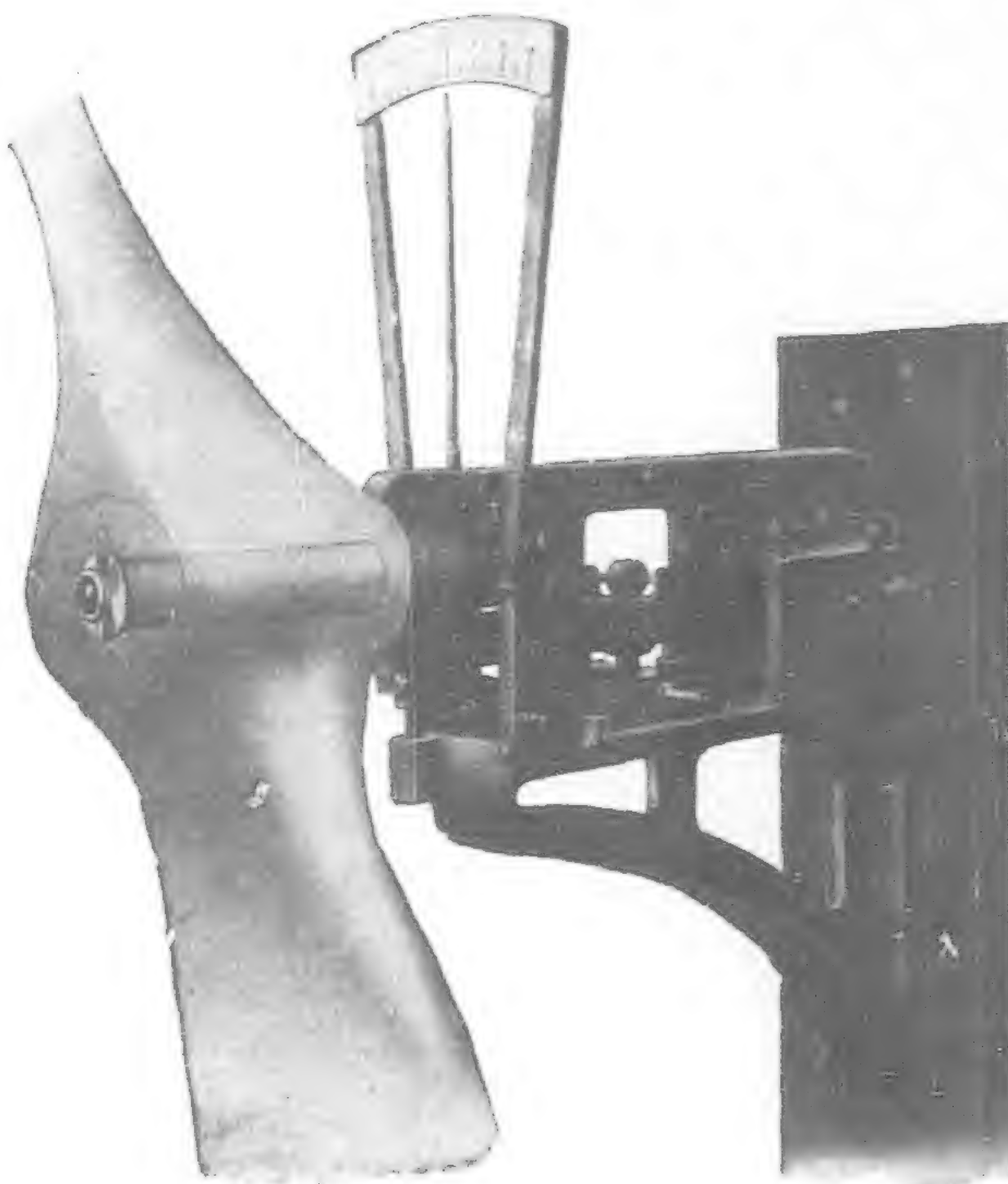
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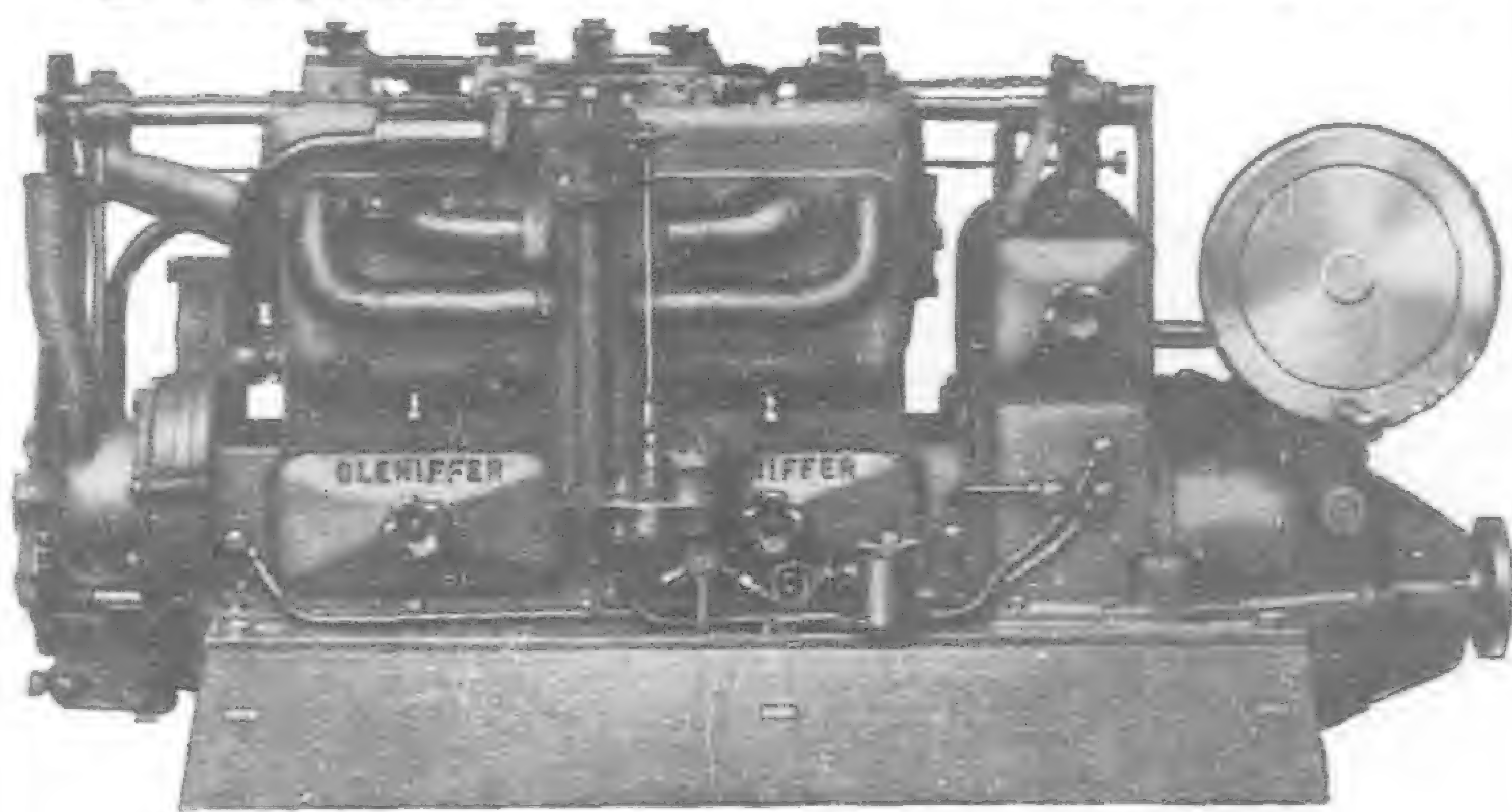
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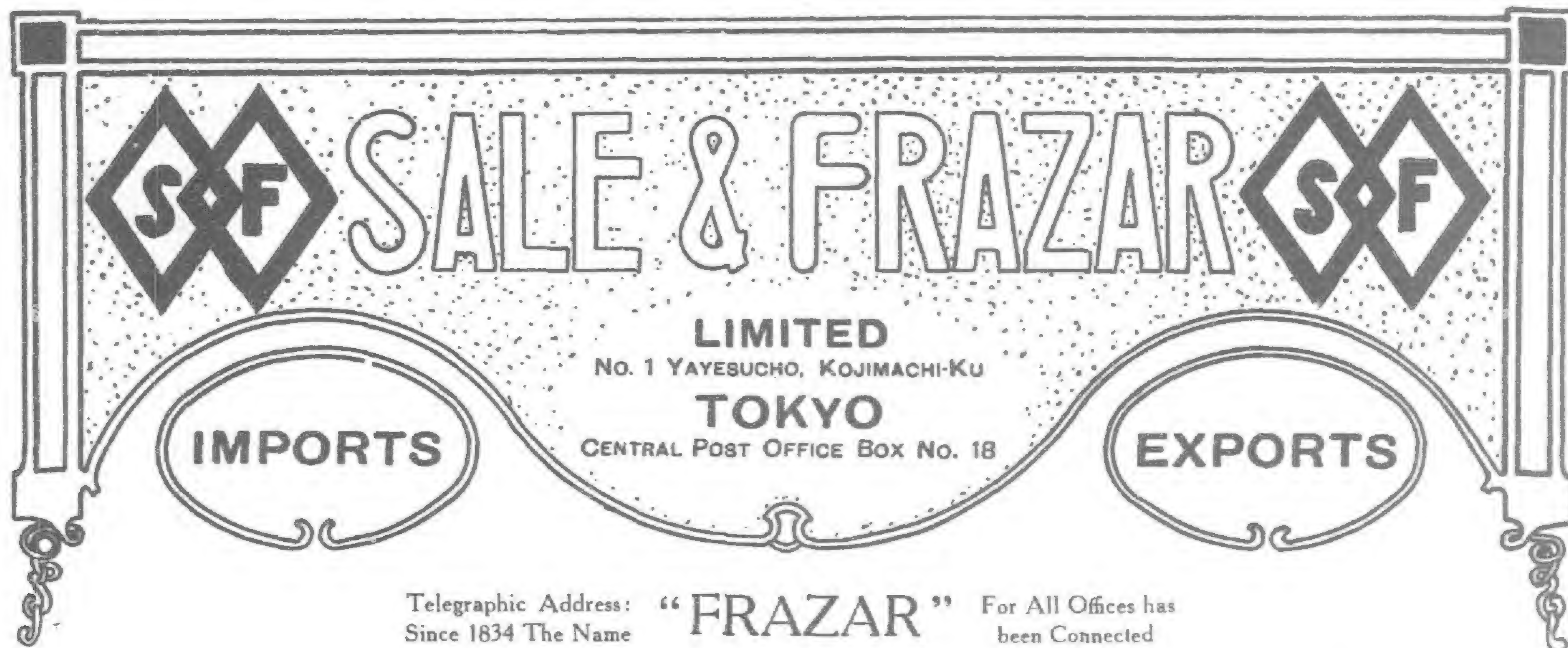
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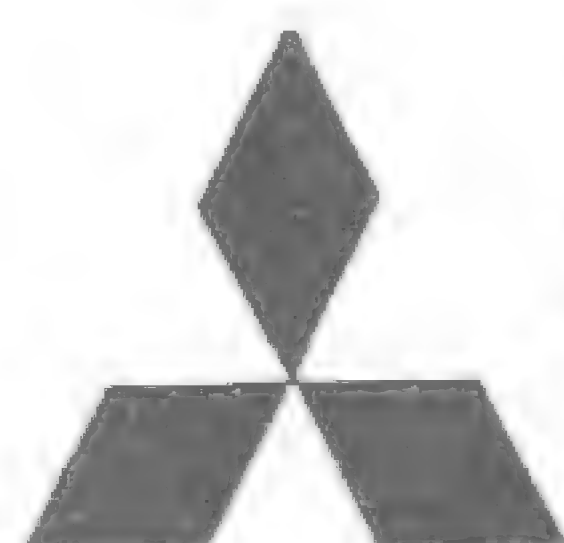
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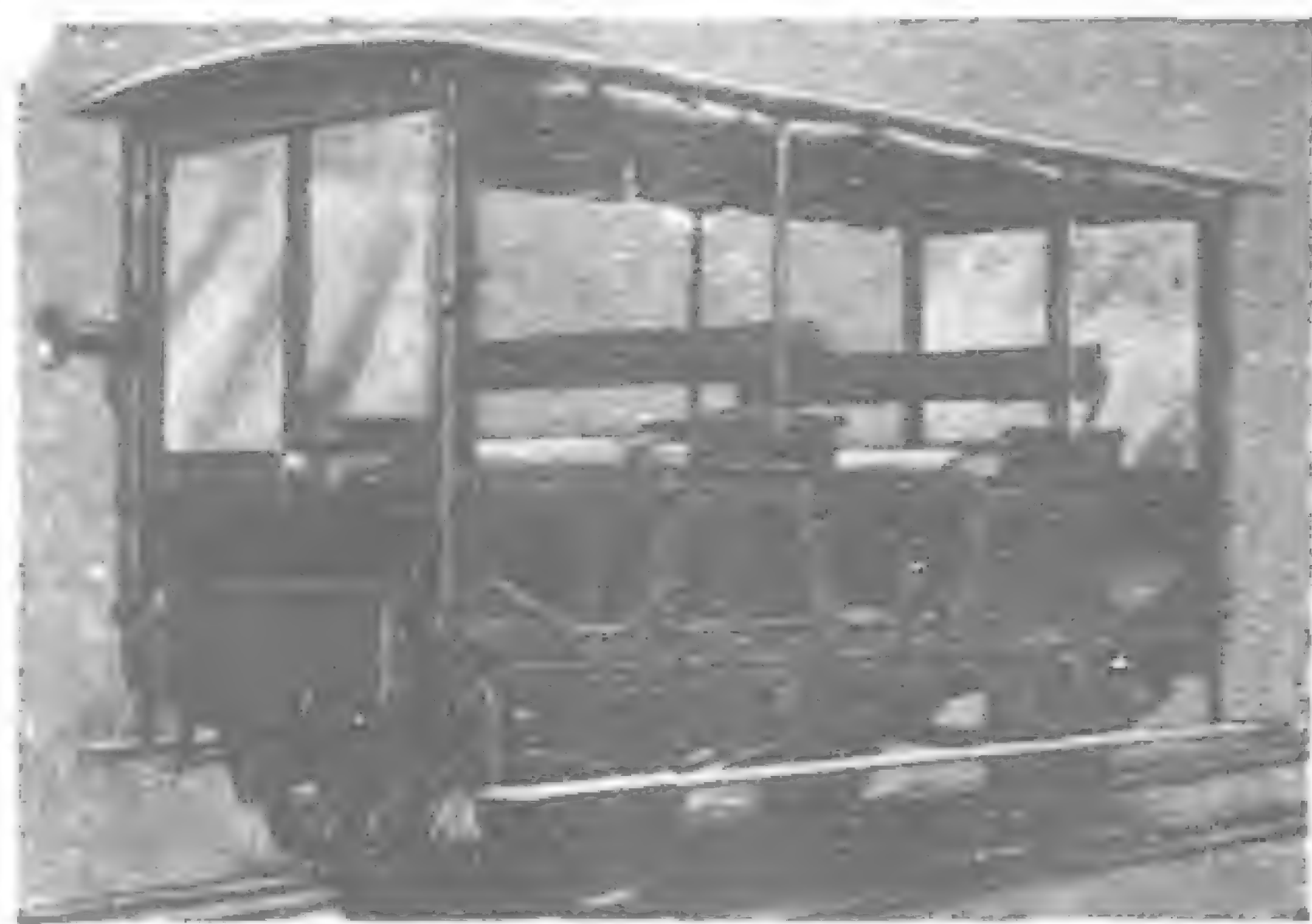
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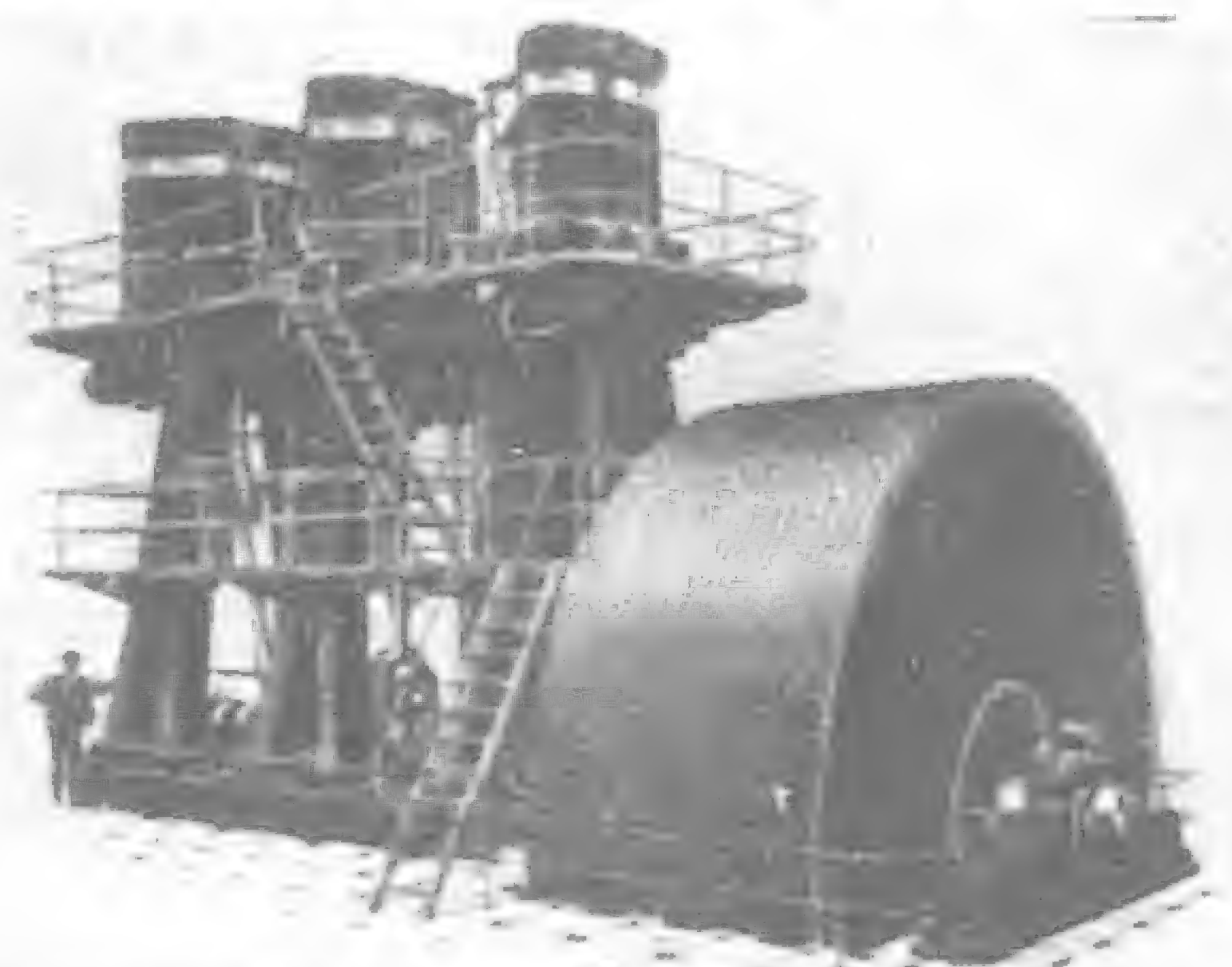
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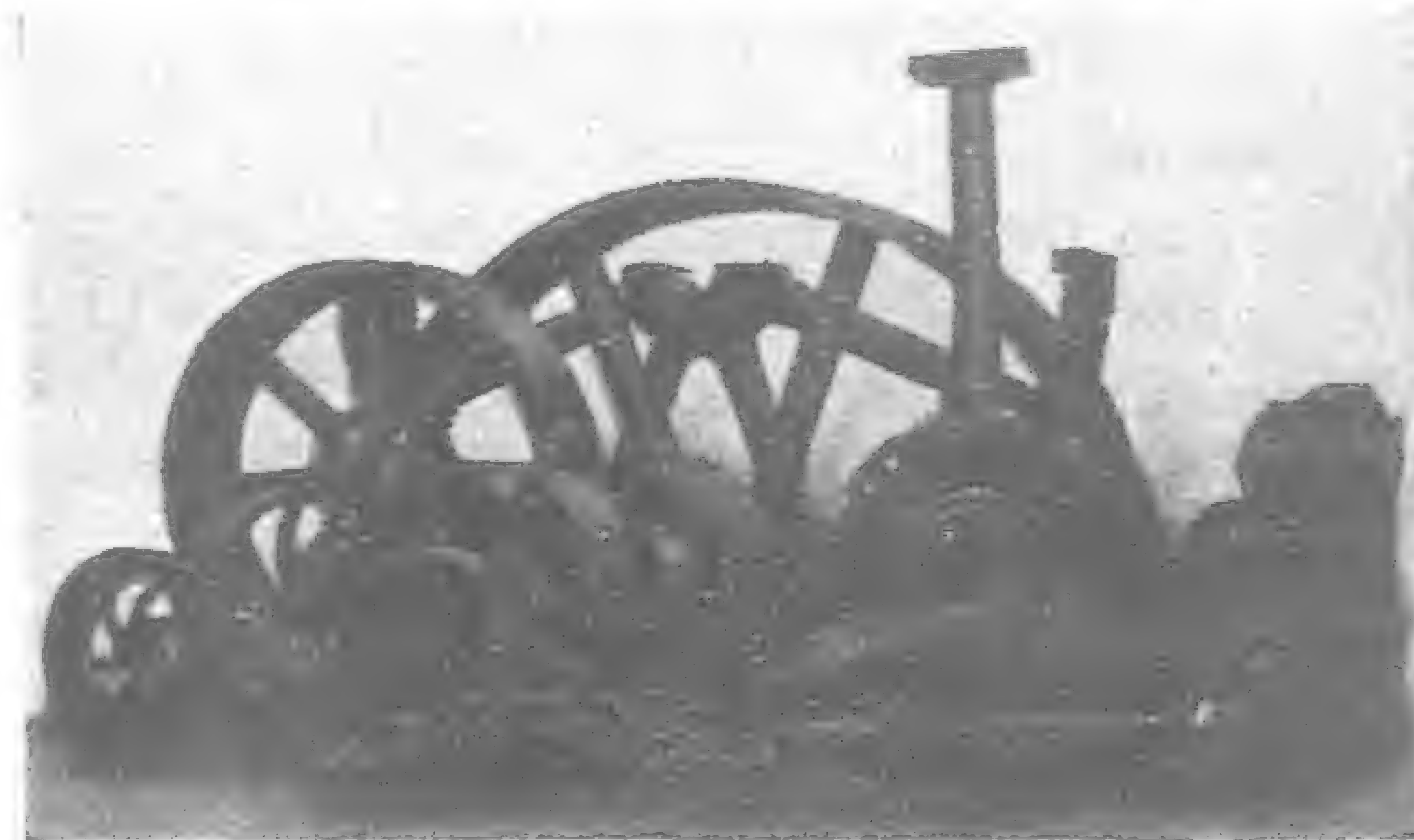
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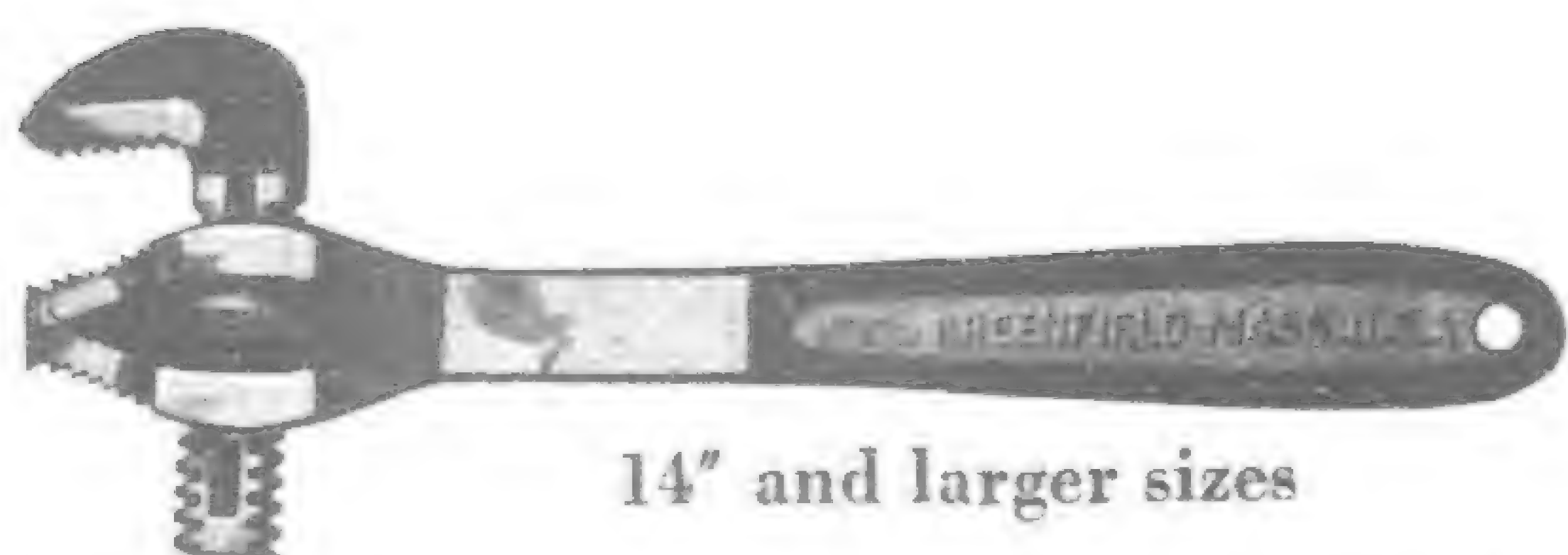
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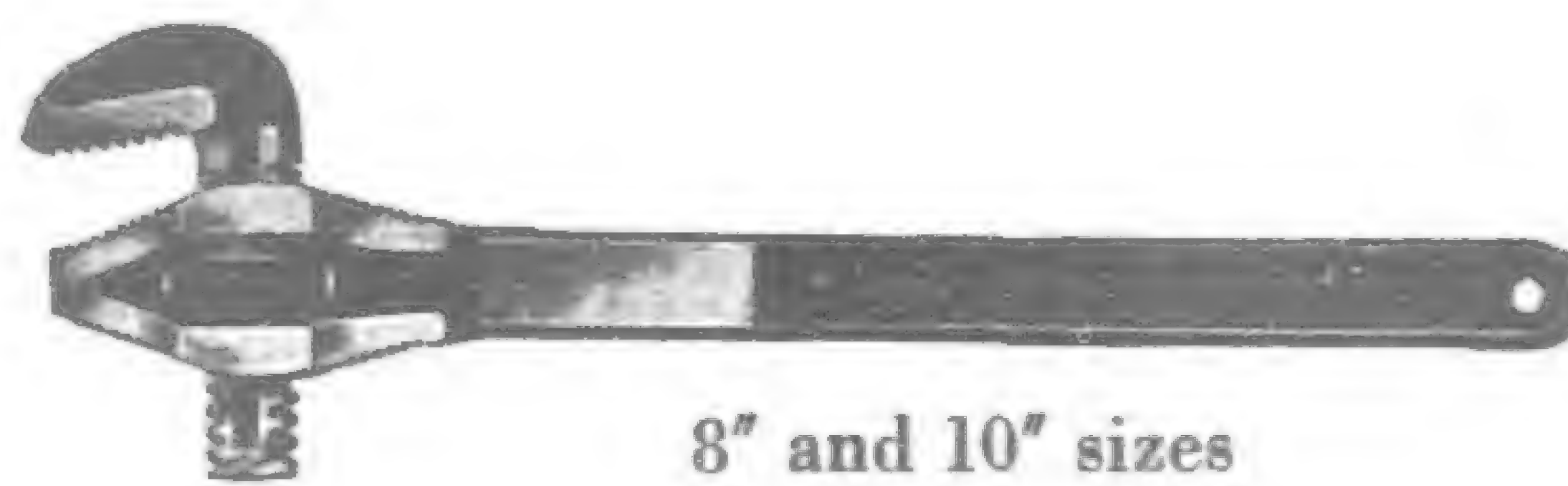
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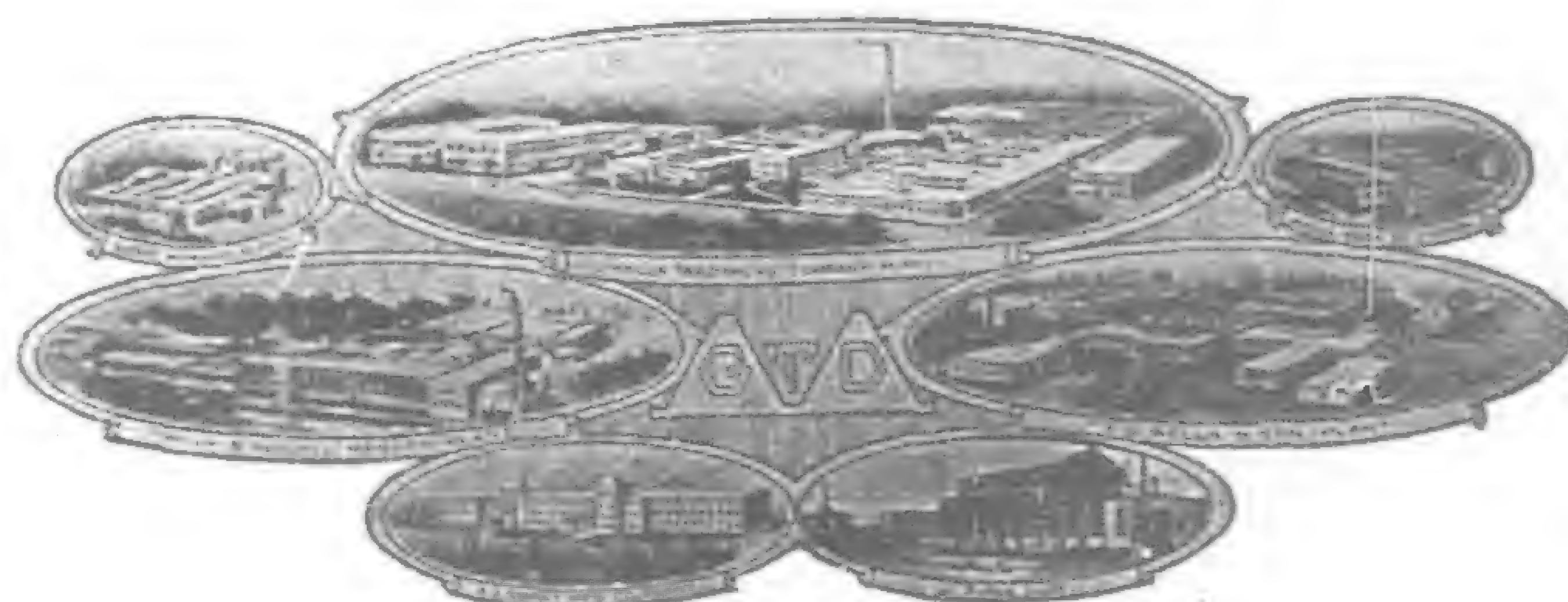
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Canadian Plant: Greenfield Tap & Die Corporation of Canada, Limited, Galt, Ontario.
Cable address: "Getede"

MULLER, PHIPPS & SELLERS, LTD. 17 Itachibori Kitadori 5-chome, Nishi-Ku Osaka, Japan Fudo Bank Bldg., 9.2- chome Honkokuchō, Nihon- bashi-ku Tokyo, Japan	MULLER & PHIPPS (CHINA) LTD. 5 Ice House St. P. O. Box 25, Prince's Bldg., Hongkong, China 1 B Jinkee Road Shanghai, China	DODGE & SEYMOUR (CHINA) LTD. 89-91 Rue Montauban, Shanghai, China	HORNE COMPANY LTD. 63 Rue de Baron Gros, Tientsin, China 6-7 Takayama-cho Kyobashi-Ku Tokyo, Japan
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Plants of G.T.D. Corporation, World's Largest Manufacturers of
Screw-threading Tools



The Green Island Cement Co., Ltd.

SHEWAN, TOMES & CO.,
GENERAL MANAGERS, HONGKONG



Are You Going to Build?

Insist on your Architect specifying the use of the best brand of Portland cement in construction. If the house or factory is to be blocks or tiles, they should be of concrete, if stucco, only the best cement should be employed; if reinforced concrete is used, only a standard cement will stand the test; if your building is to be fireproof, waterproof, safe against earthquake or typhoon, improving with age, and lowering the cost of insurance, you must employ concrete, and the best concrete construction is only secured through the use of

Green Island Cement

Green Island Cement is supplied in Bags = 250-lbs. net, Casks = 375-lbs. net, Iron Drums = 375-lbs. net.

Also, Glazed Stoneware, House Drains, Sewer Pipes, and Fittings, Paving Bricks, Tiles, Fire Bricks and Fire Clay.

The Green Island Brand has become the standard Portland Cement of Asia, owing to its purity, uniformity and tests.

Used by H.B.M.'s Government in Hongkong, United States Government in the Philippines for all important Public Works.

Also by H.B.M.'s Government in Singapore and Federated Malay States for Government Buildings, Railways and Harbour Works.

Established 1883

Telegraphic Address "ROPEWORK," HONGKONG

THE HONGKONG ROPE MANUFACTURING Co., Ltd.

Manufacturers of Pure Manila Hemp Rope

Rope supplied to
the British Navy
on the China Station
and to all Mail
and regular Steamship
Lines.



Ropes, Cables and
Hawsers $\frac{1}{2}$ -in. to
15-in. Circumference.
Driving Ropes for
Mills; Bull Ropes
and Drilling Cables
for Oil Wells a
Specialty.

SHEWAN, TOMES & CO.

General Managers

St. George's Building

HONGKONG.



MADE IN CANADA

WILLIAMS' SUPERIOR DROP-FORGED HAMMERS

Are dependable tools because:—

Their heads, drop-forged from a special grade of tough steel, carefully hardened and tempered, neither crack, chip nor splinter.

They are fastened most securely and solidly to the handles—can't work loose—can't fly off.

Their handles are made of the best grade of clear, straight-grained hickory, flared at the grip to prevent hand-slip.

The weight and length of each tool are properly proportioned to give perfect balance, and, hence, increased striking power.

*Williams' Superior Hammers of all kinds and sizes.
Catalog on request.*

J. H. WILLIAMS & CO., Ltd.

"The Drop-Forging People"

Works: St. Catharines, Canada

Export Office:
124 State Street,
New York, U.S.A.

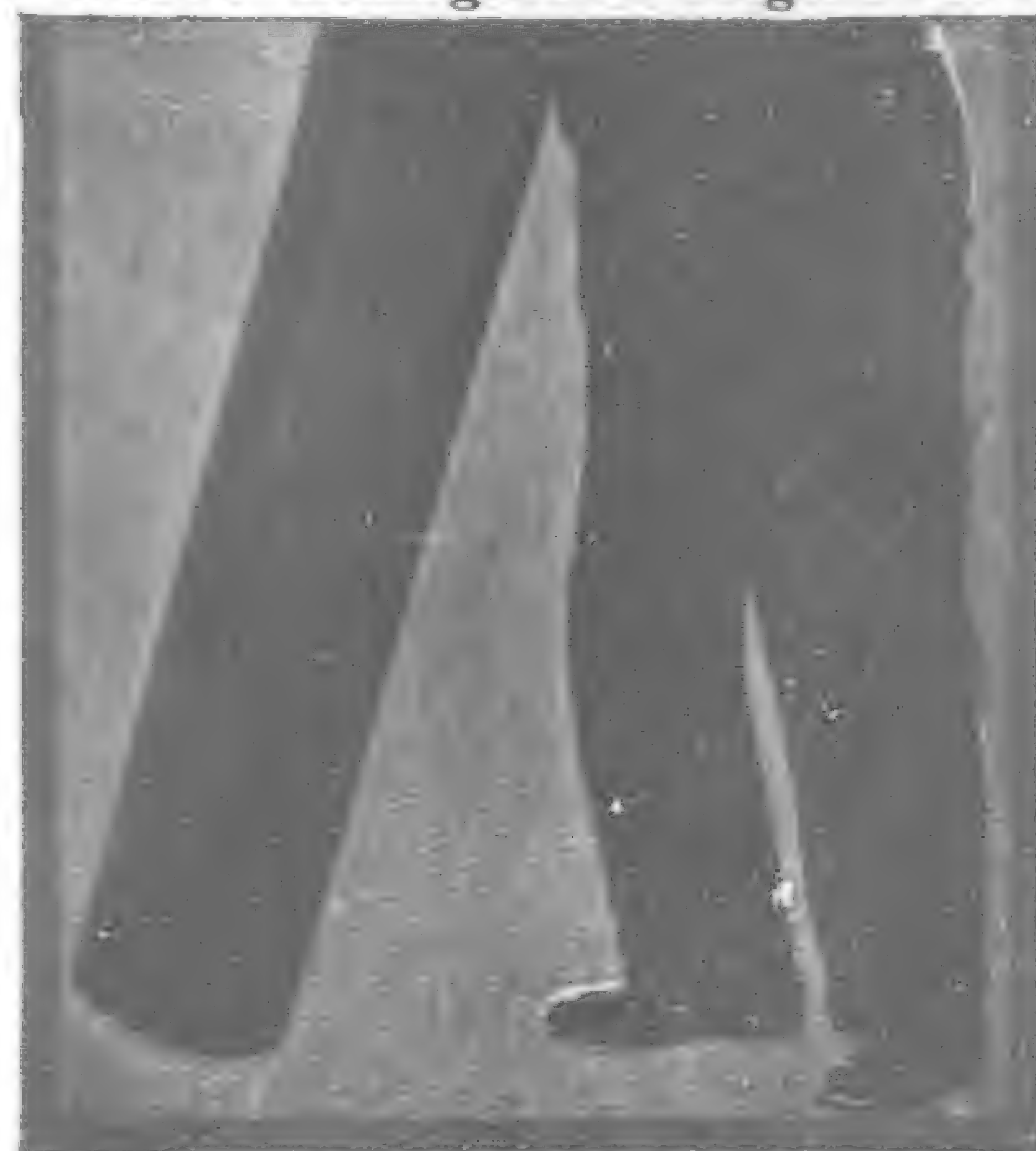
London Representative:
Benj. Whittaker, Ltd.,
Department K.
56 Ludgate Hill, E. C. 4.



MADE IN CANADA



WHARTON CYLINDERS
For Gases Charged at High Pressure



Better than Requirements!

It is not sufficient that Wharton Cylinders merely meet standard British and American specifications—they have built into them safety and endurance factors beyond requirements.

They are made from Wharton Special Cylinder Steel *billets*. They undergo six rigid tests during the manufacturing process and a final hydrostatic test. We furnish official test certificates with them. They are furnished with or without caps and valves. Deliveries are prompt.

For oxygen, acetylene, hydrogen, carbonic acid, nitrous oxide, sulphur dioxide, liquid chlorine, blast gas, etc., they have no equal.

Write us for full specifications, sizes, weights, test pressures and prices.

The parent company—Taylor-Wharton Iron & Steel Co.—is 180 years old. It manufactures manganese steel frogs, switches, crossings, gears, pinions, dipper teeth, buckets, crushing and grinding machine parts, etc.

Representatives Desired for Wharton Cylinders

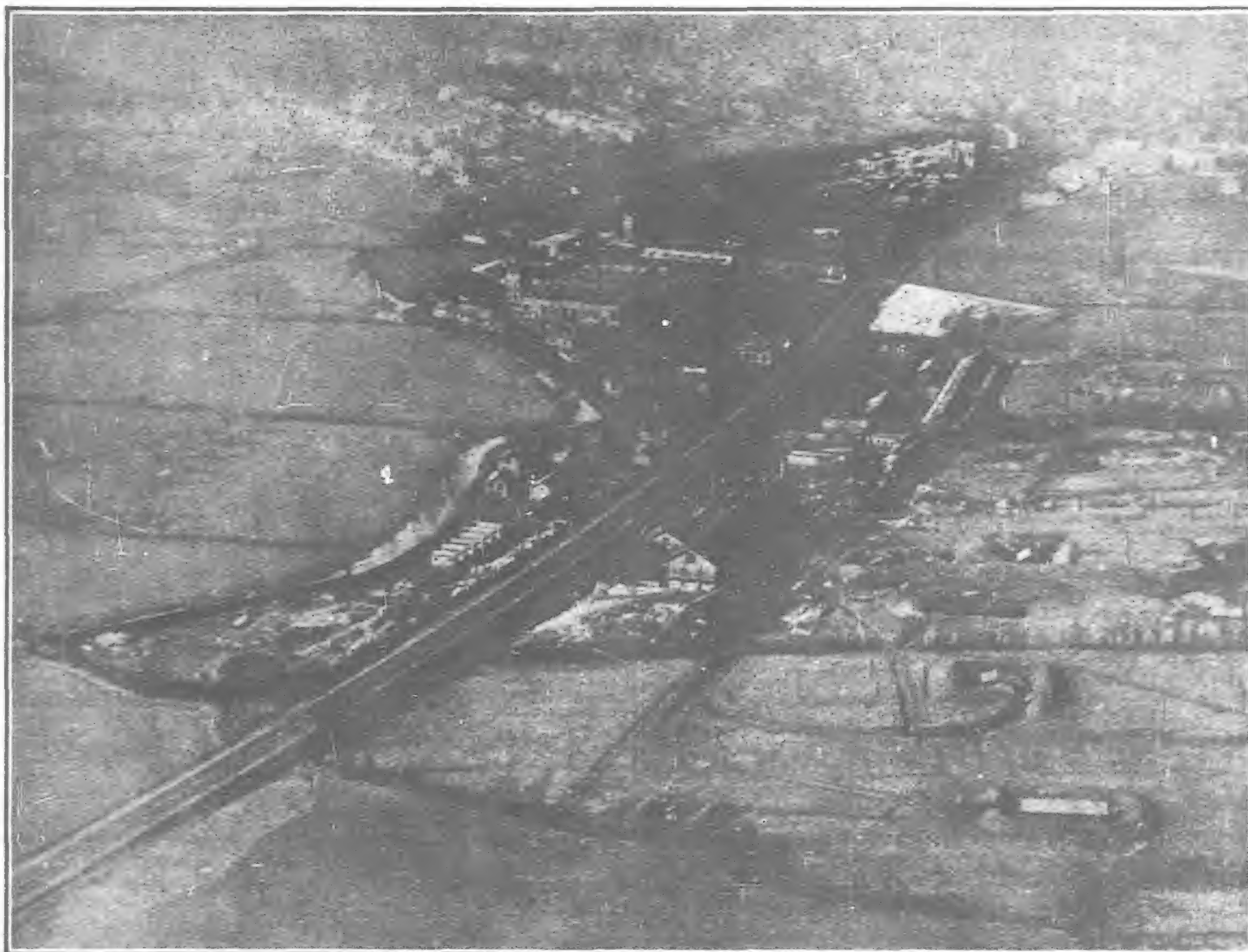
Concerns and individuals desiring to represent us are invited to write. Our facilities in manufacture and service, our reputation, stability and the worth of our product make this an unusual opportunity.

Wm. Wharton, Jr. & Co., Inc.

(Founded 1859)

30 Church St., New York, U. S. A.

Cable, Wilwharton, New York



FAMOUS FACTORIES

STOWMARKET

The above photograph, taken from the Air, shows the greater portion of the factory of "Necol" Industrial Collodions Limited, a constituent company of Nobel Industries Limited. Situated at Stowmarket, the original factory erected in 1861 for the manufacture of Nitrocellulose, has been enlarged until it now covers an area of over 200 acres. During the War, the Company supplied large quantities of Munitions and Nitrocellulose Syrup for Aeroplane Dopes, and since the change over from War to Peace conditions is now devoting its whole attention to Collodion Products under the trade name "NECOL."

Nitrocellulose for—
 Leather Cloth Manufacture.
 Manufacture of Gas Mantle Dip.
 Photographic Films.
 Coloured Celluloid Manufacture.
 Solutions for coating of Split Leather.
 Waterproofing Leather.
 Coating Gas Mantles.

Lacquers for the Metal Trades.
 Bronze Mediums for Picture Frame Trade.
 Black Enamels for ordinary Metal Work.

Coloured Enamels for colouring Celluloid, Metal or Woodwork.
 Coloured Lacquers for Electric Lamps.
 Wood Finishes for Woodworking Trades.
 Textile Stains for Decorating Fabrics.
 Collodion for Proofing Textiles.
 "Necol" Cement for stiffening Box Toes for Boots and Shoes.
 "Necol" Cement for Belting Joints.
 "Necol" Boot Repairing Cement.
 "Necol" Household Cement.
 "Necol" Plastic Wood for use by Engineers' Pattern Makers, etc.

A speciality is made of Concentrated Nitrocellulose Solutions or Dopes for all purposes in a form specially suitable for shipment to all parts of the world.

Particulars of the above and other Nobel Products can be obtained from:—



NOBEL INDUSTRIES LIMITED

Head Office:

NOBEL HOUSE, LONDON, S.W.1



Write to the Advertising Department, Nobel House, for illustrated booklet, "The Products of Nobel Industries, Ltd." mentioning this Journal.

UNITED STATES STEEL PRODUCTS COMPANY

30 Church St., New York, U.S.A.

Sole Exporters of the Products of

Carnegie Steel Company
Illinois Steel Company
American Steel & Wire Company
American Sheet & Tin Plate Company
The Lorain Steel Company

American Bridge Company
National Tube Company
Tennessee Coal, Iron & Railroad Company
Minnesota Steel Company
Canadian Steel Corporation

BRANCH OFFICES and REPRESENTATIVES IN

Antwerp, Belgium
Birmingham, England
Bombay, India
Brussels, Belgium
Buenos Aires, Argentine Republic
Calcutta, India
Concepcion, Chile
Glasgow, Scotland
Havana, Cuba

Johannesburg, South Africa
Lima, Peru
Los Angeles, California
London, England
Mexico City, Mexico
Montreal, Canada
New Glasgow, Canada
New Orleans, La
Peking, China

Port Elizabeth, South Africa
Portland, Oregon
Rio de Janeiro, Brazil
Rome, Italy
Rotterdam, Holland
San Francisco, California
Santiago, Chile
Sao Paulo, Brazil
Seattle, Washington

Shanghai, China
Soerabaya, Java
Sydney, New South Wales
Tokio, Japan
Toronto, Canada
Valparaiso, Chile
Vancouver, Canada
Winnipeg, Canada

WAREHOUSES AT

Antwerp, Belgium
Bombay, India
Buenos Aires, Argentine Republic

Calcutta, India
Callao, Peru
Port Elizabeth, South Africa

San Francisco, California
Santiago, Chile
Sao Paulo, Brazil

Talcahuano, Chile
Valparaiso, Chile

We give prompt attention to inquiries for all class of our Steel Products, including the following :—

AERIAL TRAMWAYS—Reversible, specially designed
ALLOY STEEL
ALLOY STEEL SHEETS
AMMONIA CYLINDERS
ANGLES
ARMATURE SHEETS
AXLES—Locomotive, Railroad and Tramway Cars
BAMBOO STEEL
BARBED WIRE
BARS—Merchant and Concrete Reinforcement
BILLETS
BLACK SHEETS
BLOOMS
BOILER TUBES, Lapwelded and Seamless
BOLTS AND NUTS
BRIDGES—Railway, Highway, specially designed
BUILDINGS—Steel Warehouses, Structural Steel for Buildings
CABLES—Steel Hoisting and Haulage Cables
CARS—Steam Railway, Mine and Industrial Railway Cars
CAR ANGLES
CAR WHEELS
CHANNELS
COLD ROLLED FLAT WIRE
COPPER RAIL BONDS
COPPER BEARING STEEL SHEETS
DERRICKS
DRILLING MACHINES
DRILLING RIGS FOR OIL WELLS
DUGUESNE RAIL JOINTS
ELECTRICAL SHEETS

ELECTRICAL WIRES AND CABLES—Bare and Insulated
FABRICATED STRUCTURAL MATERIAL FOR BRIDGES, TURNABLES, STEEL BUILDINGS, ETC.
FENCING MATERIALS—Wire Fencing, Steel Posts
FORGINGS
FROGS AND SWITCHES—Steam and Electric Railways
HOOPS AND BANDS
MACHINE FORGINGS
MINE TIMBERS
NAILS—Wire
NAIL RODS
NAIL WIRE
PIG IRON
PILING—Steel Sheet
PIPE—Black and Galvanized Wrought, for Steam, Gas and Water, American or English Threads; Lapwelded Boiler Tubes, Matheson Lead Joint Pipe, Seamless Steel Tubing
PLATES—Boiler, Tank, Ship, Flange and Fire Box Steel
POLES—Steel Tubular
RAILS—Light and Heavy Rails for Railways, Tramways, Mine and Industrial Railways. Special Track Work
REINFORCEMENT FOR CONCRETE—Triangle Wire Mesh
RIVETS
ROPE—Wire for Mine Hoists, Derricks, Cranes, etc.
SCREW SPIKES

SCREW STOCK—Cold Drawn
SHAFTING
SHAPES—Standard Structural
SHEET BARS
SHEETS—"Apollo" Brand, Galvanized, Corrugated and Plain
SKELP
SLABS
SPIKES—Railway Track Spikes
SLEEPERS—Steel
SPRING STEEL
STEAM PIPE AND TUBES
STOVE PIPE SHEETS
SWITCHES AND SWITCH STANDS
TANK PLATES
TERNE PLATES
TIN MILL PRODUCTS
TIN PLATE—"Coke," "Charcoal" and "Terne"
TOOL STEEL
TOWERS—Steel
TRIANGLE MESH CONCRETE REINFORCEMENT
TUBES—Gas, Water, Steam and Boiler
TURNABLES FOR LIGHT AND HEAVY RAILWAY SERVICE
UPHOLSTERY SPRINGS
WASHERS
WEATHERPROOF INSULATED WIRES AND CABLES
WHEELS—Solid Rolled Steel for Steam, Electric, Mine and Industrial Railways.
WIRE—Bright, Annealed, Galvanized, Baling and Fencing and all Classes of Coated and Uncoated for Manufacturing Purposes.

The Combined Actual Annual Ingot Production of our Manufacturing Companies for the year 1920 was in excess of 19,000,000 tons.

SHANGHAI OFFICE: Union Building—The Bund and Canton Road

PEKING OFFICE: No. 22 Wu Liang Ta Jen Hutung

TOKYO OFFICE: No. 15 Nakadori, Marunouchi

OKURA & CO. (TRADING) LTD.

No. 2 Canton Road, Shanghai

President :
Baron K. Okura

BRANCHES at Hakodate, Yokosuka, Yokohama, Osaka, Kobe, Maizuru, Kure, Moji, Saseho, Keelung, Taihoku, Seoul, Antung, Penhsihu, Mukden, Tientsin, Peking, Hankow, Changsha, Kiukiang, Tsingtau, Hongkong, Vladivostok, Sydney, San Francisco, New York, London.

Head Office :
Ginza, Tokio

GENERAL IMPORTERS AND EXPORTERS

Rails, Bridges, Locomotives and other Railway Supplies
Electric Plants, Electrical Supplies
Sugar Plants, Spinning Machinery, Machine Tools
Factory Equipments, and all kinds of Machines
Automobiles, Guns and Explosives
Structural Materials, Steel Materials, Metals
Mineral Products, Chinese and Japanese Produce, Silk
Cotton, Wool, and their Manufactures
Fertilizers, Chemicals, Vegetable Oils and Wax, Dye Stuffs
Food Stuffs, Hides and Fur, Skins, Pen-hsi-fu Smokeless Coal and Pig
Iron, etc.

BUILDING AND CIVIL ENGINEERING CONTRACTORS,
INSURANCE AGENTS

Yih Chong Wharf (Okura)

POOTUNG, SHANGHAI



LOCOMOTIVES



Our organization is equipped to furnish every facility which long experience and abundant capital can provide for producing high-class work, and for conducting the business of manufacturing locomotives on the most economical basis to both purchaser and manufacturer.

American Locomotive Sales Corporation

New York City

Telegraphic Addresses :

Locomotive : Peking, China

Bamco : Sydney, Australia

Mitsui : Tokio, Japan

Nottac : Manila, P.I.

Dilpax : Honolulu, Hawaii



Cable Address:
"MITSUI"

MITSUMI **BUSSAN KAISHA**

LIMITED

MITSUMI & CO., LTD. (IN EUROPE AND AMERICA)



Capital: Yen 100,000,000
Reserve: „ 30,000,000

IMPORTERS AND EXPORTERS **SHIPOWNERS AND SHIPBUILDERS**

Head Office: TOKYO, JAPAN

Branches:

HOME—Yokohama, Nagoya, Osaka, Kobe, Otaru, Muroran, Hakodate, Niigata, Moji, Wakamatsu, Kuchinotsu, Nagasaki, Karatsu, Miike, Taipeh, Keelung, Tainan, Takow, etc., etc.

ABROAD—London, Marseilles, Lyon, Hamburg, New York, San Francisco, Seattle, Portland, Ore, Buenos-Aires, Manila, Bombay, Karachi, Calcutta, Singapore, Bangkok, Rangoon, Soerabaya, Batavia, Semarang, Sydney, Melbourne, Hongkong, Canton, Amoy, Foochow, Shanghai, Chefoo, Hankow, Changsha, Newchwang, Tientsin, Dairen, Antunghsien, Mukden, Tieling, Chungchun, Vladivostok, Harbin, Seoul, Chemulpo, Fusan, etc., etc.

SHIPBUILDERS, ENGINEERS AND REPAIRERS **SHIPYARDS AND DRYDOCKS AT TAMA,** **OKAYMA, JAPAN, For Construction and Repairing**

PRINCIPAL LINES OF BUSINESS:

EXPORT.

Raw Silk and Silk Textiles, Coal, Lumber, Rice, Seeds, Beans, Flour, and Other Cereals, Sugar, Copper and other Metals, Vegetable and Wood Oils, Camphor, Matches, Fertilizers, Paper, Canned Foods, Fish Products, Tea, Sulphur, Cement, etc., etc.

IMPORT.

Machinery and Tools, Ships, Steel and Iron, Locomotives, Rails and other R. R. Equipment, Sugar, Rice, Wool, Phosphate, Sulphate of Ammonia, Nitrate of Soda, Rubber, Dyes, Drugs and Chemicals, Jute and Gunnies, Flax and Hemp, Wheat, Seeds, and other Cereals, Bean Cakes, Lumber, etc., etc.

ENGINEERING DEPARTMENT

Sole Agents for Leading American and European Makers, including

American Locomotive Co.
Bucyrus Co.
California National Supply Co.
De La Vergne Machine Co.
General Electric Co.
General Motors Export Co.
Manning Maxwell & Moore, Inc.

Mesta Machine Co.
Nordberg Manufacturing Co.
Sullivan Machinery Co.
Belliss & Morcom, Ltd.
Geo. Cradock & Co., Ltd.
Platt Brothers & Co., Ltd.
Ruston & Hornsby, Ltd., etc., etc.

Also, AGENTS IN JAPAN, ORIENT, and INDIA for Well-known Japanese Insurance Cos.



Pipe Co., Rio de Janeiro

Our Wide Experience

In the course of our twenty years experience in steel fabrication and construction, almost every demand has been made on our resources—and has been met successfully.

Whatever be the size of type of your requirements let us help you to materialize them. From the mighty lock gates of the Panama Canal to the simpler types of steel construction we can do the work and do it right.

Send us your plans and write for booklet No. 30.

We Design, Manufacture and Erect

Steel Industrial Plants
Railroad and Highway Bridges
Lock Gates
Blast Furnace Plants
Steel Storage Tanks
Riveted Steel Pipe
Steel Transmission Towers
Steel Ships and Barges
Oil Refining Plants
Gas Plants and Gas Holders
Ore Bridges
Etc.

McClintic-Marshall
Annual Capacity, 400,000 Tons

McClintic-Marshall Products Co.
Works: PITTSBURGH, U.S.A.

Foreign Contract Department, 50 Church Street
NEW YORK, U.S.A.

Cable Address

Codes

"Macmarsh" New York Bentleys, General, Western Union, Lieber

England: George A. Smith, St. Stephen's House, Westminster, S. W. 1, London

France: Produits Metallurgiques McClintic-Marshall, 8, Rue Edouard VII, Paris

South Africa: Robertson & Moss, 11-17 Trust Building Johannesburg

China: Lam, Glines & Company, 4-B Peking Road, Shanghai

Japan: H. E. Root, 73 Yamashita-cho, Yokohama

Cuba: San Ignacio y Obrapia, Havana

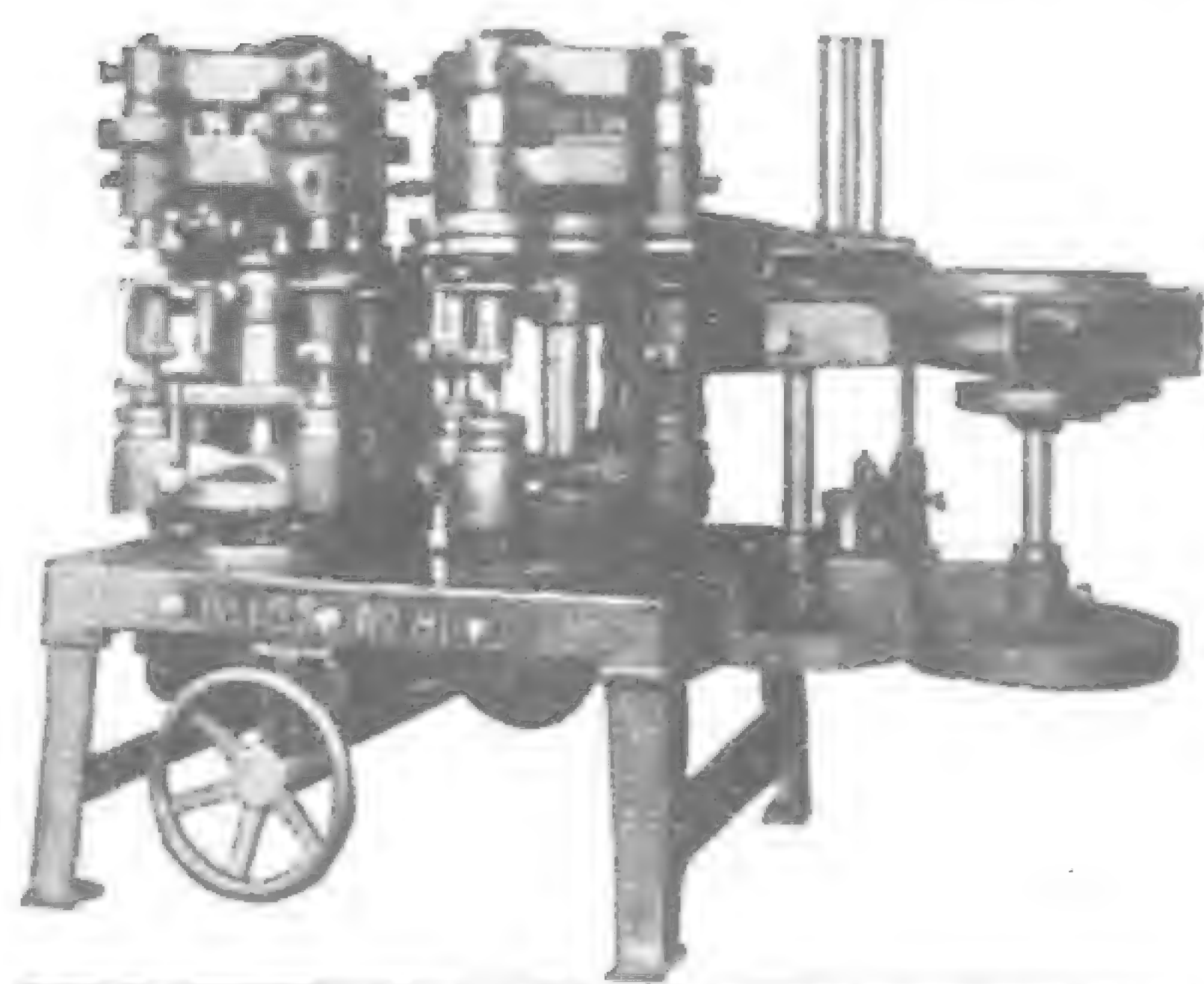
McClintic-Marshall

**MACHINERY for Manufacturing Tin Cans—Tin Ware—Metal Packages
Cutlery—Hardware—Aluminum Ware and Enamel Ware—Electrical
Equipment. Also Horseshoe—Minting and Drop Forging Machinery**

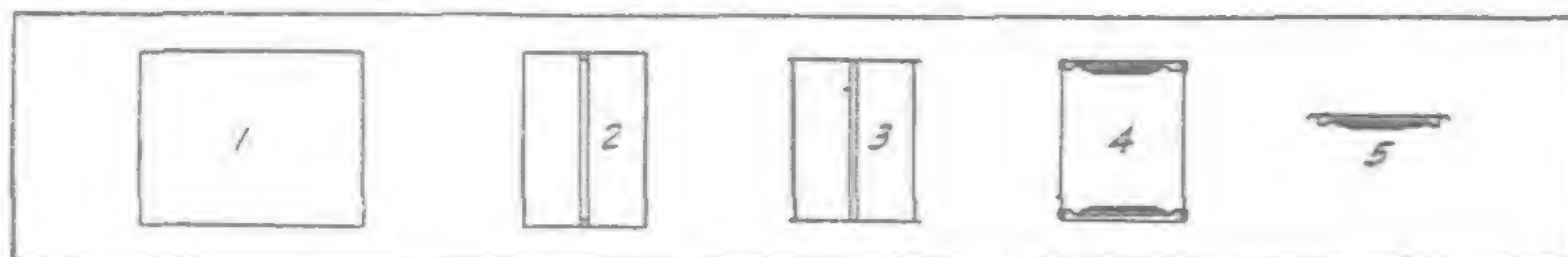
1857



1923



"BLISS" No. 81 Double Seamer—The simplest and fastest machine built for attaching ends to bodies; built in two styles, one for the can shop and one for handling filled cans in the cannery. This is one of the machines which go to make up our High Speed Automatic Sanitary Can Making Line.



In previous advertisements we illustrated Tin Can Machinery for small production. In this one we show one of the machines which go to make a standard unit for quantity production of round sanitary tin cans for fruits and vegetables. Each unit has a daily capacity of over 90,000 tin cans.

The illustration above shows the different operations in making a Sanitary Tin Can with "BLISS" High Speed Automatic Tin Can Machinery. They are as follows: Slitting, Body Notching, Neck Forming, Body Forming, Side Seam Closing and Soldering, Body Flanging, Double Seaming, Making Ends, Applying Compound, Testing.

"BLISS" High Speed Automatic Sanitary Tin Can Machinery is "standard the world over" and in successful operation in every country. To quote we must have samples or drawings of the cans and know daily production desired.

"BLISS" on your machinery is more than a name; it is a guarantee.

E. W. BLISS CO. MAIN OFFICE AND WORKS BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N.Y. HASTINGS, MICH. CLEVELAND, OHIO. SALEM, OHIO.

FOREIGN SALES OFFICES AND FACTORIES:

ENGLAND, Pooock St., Blackfriars Rd., S. E., London

ITALY, 345 Via Nizza, Turin

FRANCE, 54 Blvd. Victor-Hugo St. Ouen, Paris

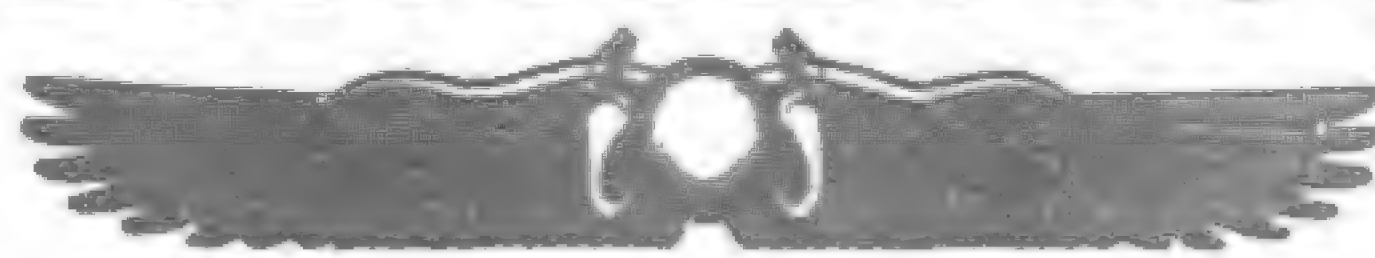
FOREIGN REPRESENTATIVES:

INDIA
Alkin and Duff Eng. Co.,
Clive Building, Calcutta

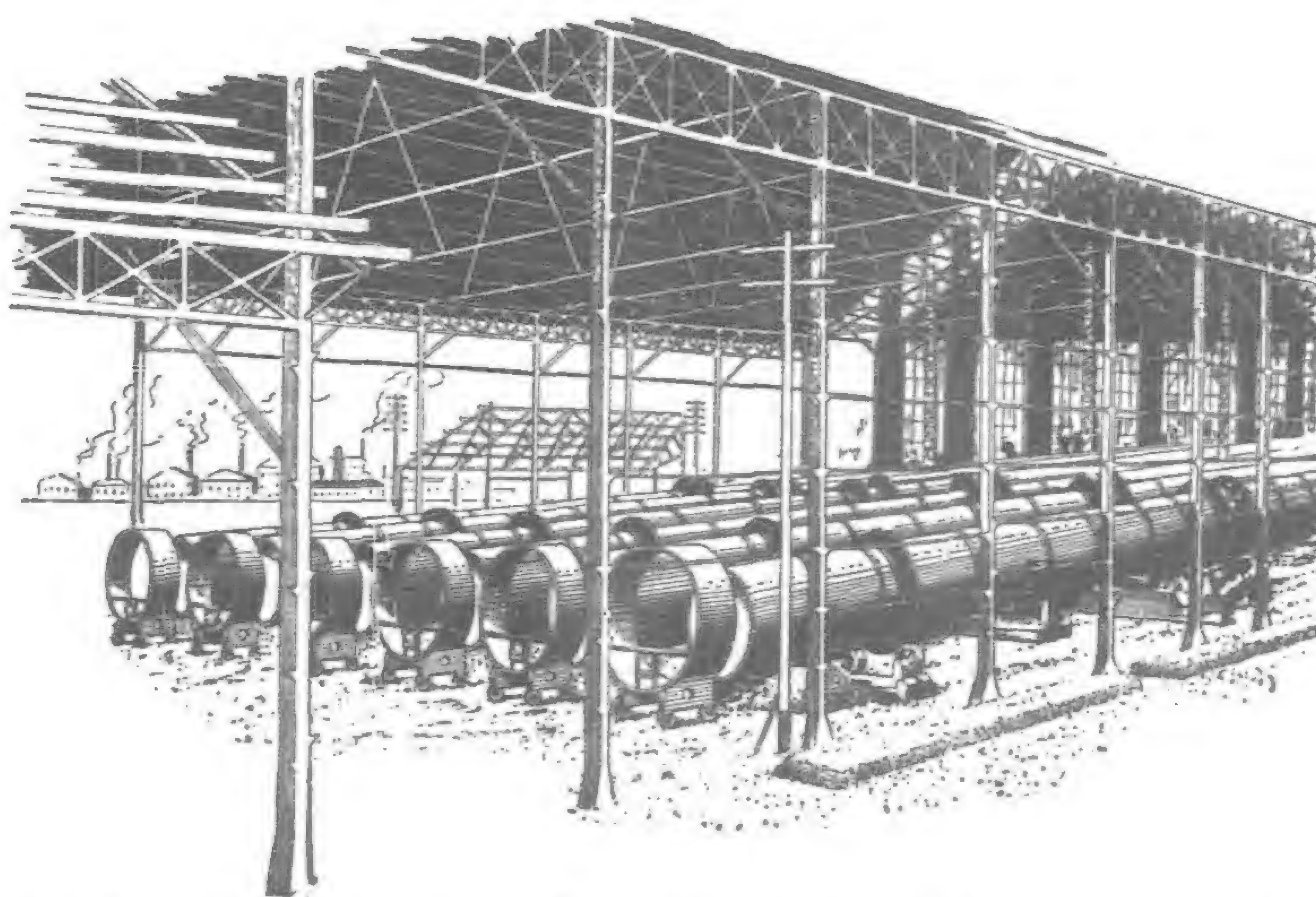
JAPAN
Horne Company, Ltd.
Tokyo, Osaka

CHINA
Allied Machinery Co. of America,
Shanghai, Tientsin, Dairen, Manchuria

WORTHINGTON



CEMENT MAKING MACHINERY



*Installation showing Worthington Rotary Kilns for burning the mixture to a clinker.
The size runs as large as 10 feet in diameter and 240 feet in length.*

The use of cement for all forms of construction has caused the consumption in the Far East to increase at a rapid rate. To meet the demands of this fast growing industry investors have seized the first opportunity to start local cement mills.

It is obvious that the design and construction of a modern cement plant, costing many thousands of dollars, should be placed with a firm whose knowledge, experience

and facilities insure for the owners a maximum production at a minimum cost.

The Worthington Pump and Machinery Corporation, represented in China by Andersen, Meyer & Co., Ltd., is well fitted for designing and equipping complete cement mills by either the wet or the dry process.

Upon receiving particulars we will be pleased to furnish detailed information.

Andersen, Meyer & Co., Ltd.

Shanghai



M31

Outports

STANDARD OIL COMPANY OF NEW YORK

26 Broadway

New York



The Mark of Quality

SOCONY PRODUCTS

Illuminating Oils

Lubricating Oils

Gasoline and Motor Spirits

Lamps, Stoves and Heaters

Road Oils and Material for Road Building

Paraffine Wax and Candles

BRANCH OFFICES IN PRINCIPAL CITIES OF

Japan

Siam

India

China

Philippine Islands

South Africa

Indo-China

Straits Settlements

The Levant

Netherlands India

THE HONGKONG & WHAMPOA DOCK CO.

LIMITED,

HONGKONG

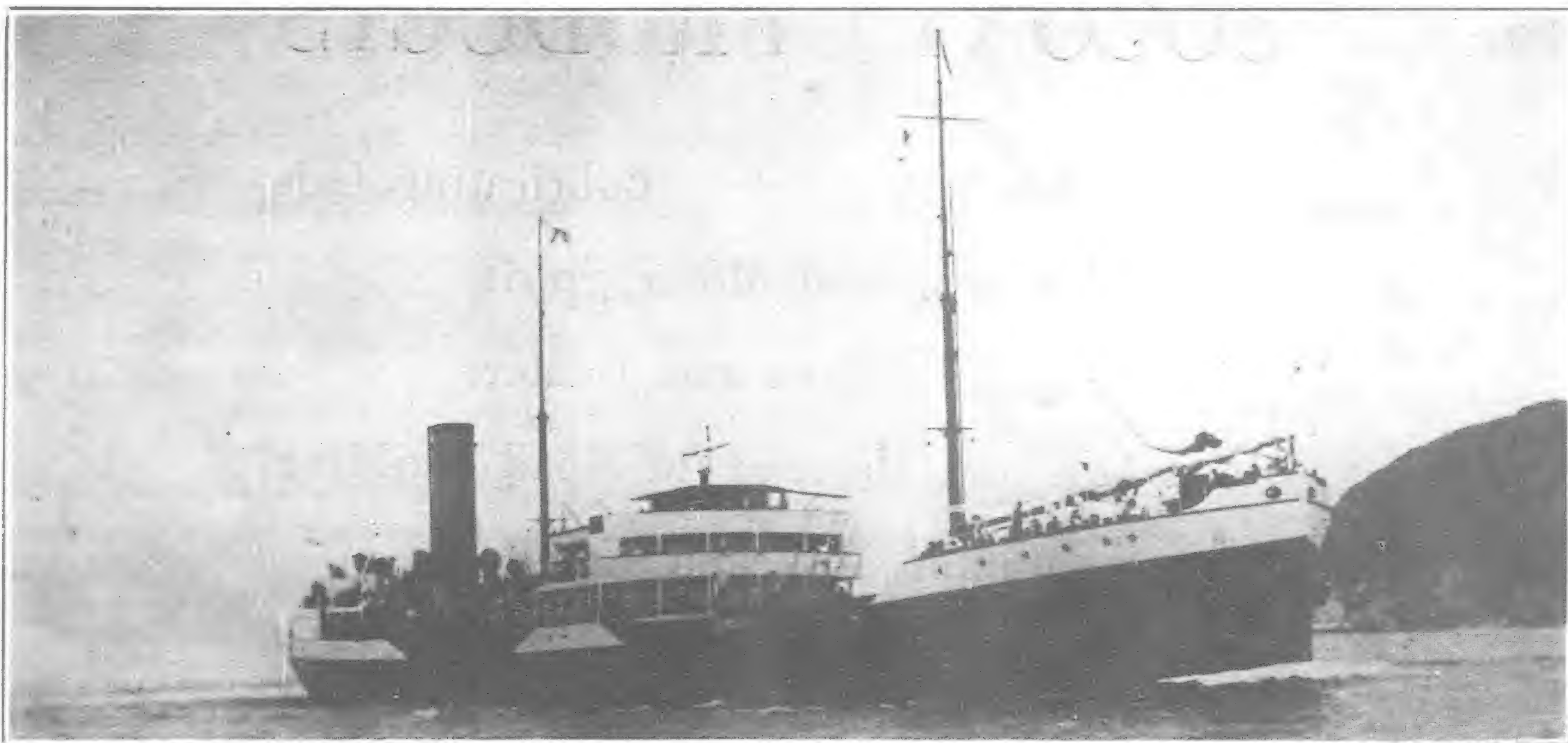
BUILDERS AND REPAIRERS OF SHIPS AND ENGINES OF ALL KINDS

and Makers of

BOILERS, IRON and BRASS CASTINGS, FORGINGS and CONSTRUCTIONAL
IRON WORK, RAILWAY ROLLING STOCK, Etc

*Dock Owners, Ship Builders, Marine and Land Engineers,
Boiler Makers, Iron and Brass Founders,
Forge Masters, Electricians*

The Company possesses Six Granite Docks and Two Patent Slipways and these are Equipped for Expeditious Work. The Plant is of the most modern type throughout. Ship Owners and Captains are assured that Docking and Repairs are carried out Promptly and at Moderate Charges.



Oil Tank Steamer *PALUDINA*, 427-ft. 0-in. by 53-ft. 1-in. by 31-ft. 0-in. by 8,400 tons d.w. by 3,100 H.P. Built by THE HONGKONG & WHAMPOA DOCK CO., LTD. at KOWLOON DOCKS to the order of THE ANGLO-SAXON PETROLEUM CO., LTD., being one of four similar vessels built in these Works to the same order.

Address Enquiries to the Chief Manager, R. M. DYER, B.Sc., M.I.N.A., Kowloon Docks, Hongkong

HEAD OFFICE: KOWLOON

TELEPHONE No. 55 K.

TOWN OFFICE: QUEEN'S BUILDINGS

TELEPHONE No. 20 HONGKONG

TELEGRAPHIC ADDRESS: "MANIFESTO" HONGKONG

Codes Used: A1; A.B.C., Fifth Edition; Engineering, First and Second Editions; Western Union and Watkins

MACHINE TOOLS

With Steel Plate or
Cast Iron Frames



Section Bar Cropping Machine

Punching and Shearing Machines.

Plate Bending Machines.

Plate Straightening Machines.

Plate Edge Planing Machines.

Plate Shearing Machines.

Steam Bending and Straightening
Machines.

Bar Cropping Machines.

Multiple Punching Machines.

etc. etc.

CRAIG & DONALD LIMITED

Johnstone, Nr. Glasgow, Scotland

BABCOCK & WILCOX, LIMITED

PATENT WATER-TUBE STEAM BOILERS

SUITABLE FOR ALL INDUSTRIES, AND FOR BURNING ANY KIND OF FUEL
ALSO MAKERS OF "EXPRESS" TYPE LIGHT-WEIGHT BOILERS

ADVANTAGES:

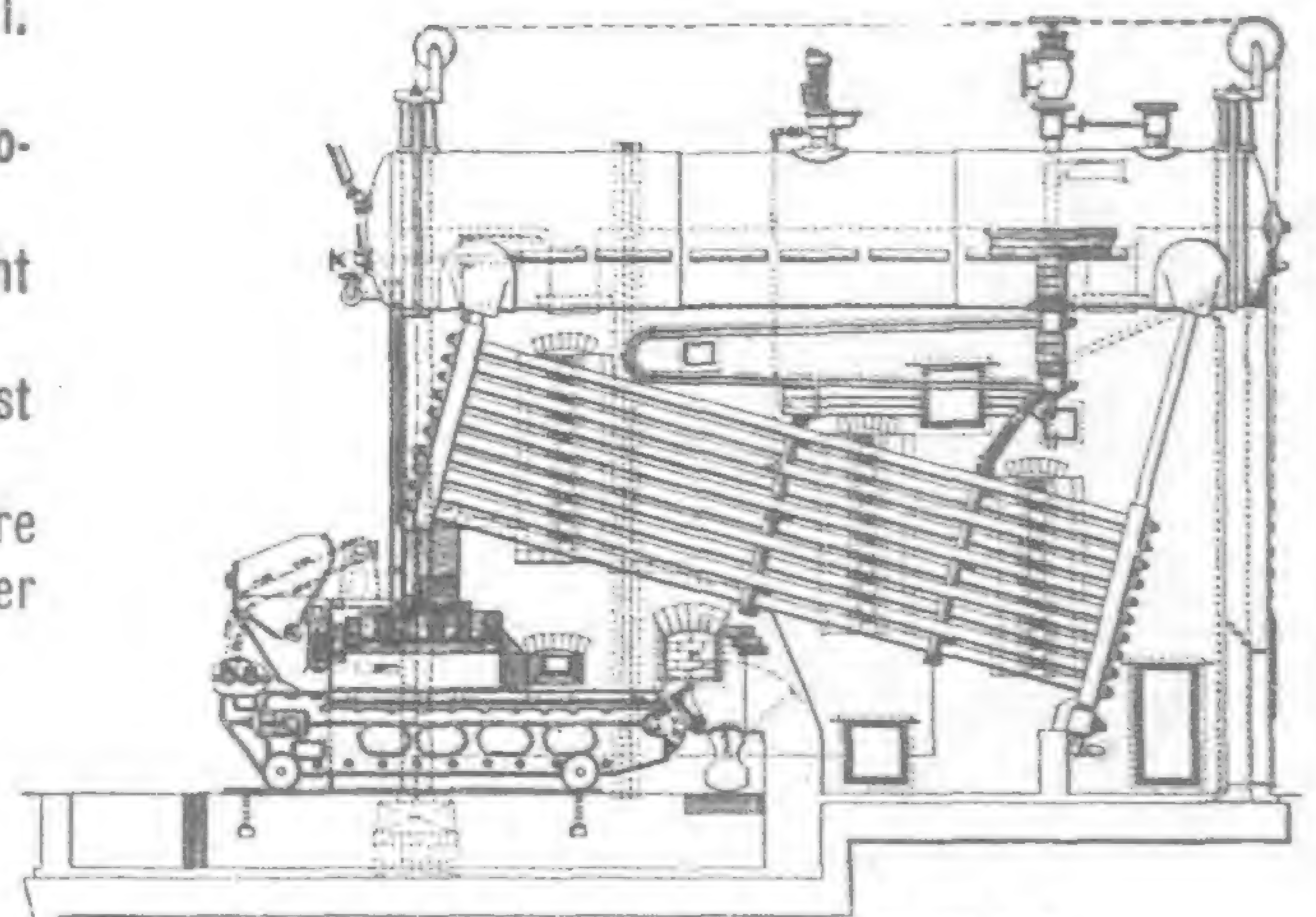
Simple in Design. Easy to
Clean
Constructed of Wrought Steel.
Rapid Steam Raiser
Economical in coal. Econo-
mical in Repairs
Very Durable. All Straight
Tubes
No Screwed Joints. No Cast
Metal
No Joints exposed to the Fire
Rapid Circulation of Water
Steady Water Level
Ample Steam Space

Largely installed in
China and Japan

22,300,000 H.P. For Land And Marine
Work installed or on order.



Babcock & Wilcox Marine Boiler



BABCOCK & WILCOX LAND BOILER,
fitted with Patent Superheater and Chain Grate Stoker
For Burning Chinese and Japanese Coal Smokelessly

Complete Steam Piping Plants and all Boiler House Accessories

Head Office in China: 1 THE BUND, SHANGHAI
" " Japan: 1 1-CHOME, YURAKU-CHO, KOJIMACHIKU, Tokyo

MANUFACTURERS OF

Steam Superheaters
Feed-Water Heaters
Coal Conveyors
Suction Ash Plants

Economisers
Water Softeners and Purifiers
Structural Work
Liquid Fuel Equipment

Mechanical Stokers
Steel Chimneys
Electric and Oil-driven
Cranes

The Shanghai Dock and Engineering Co., Ltd.

Established 1862

(LATE S. C. FARNHAM, BOYD & CO., LTD.)

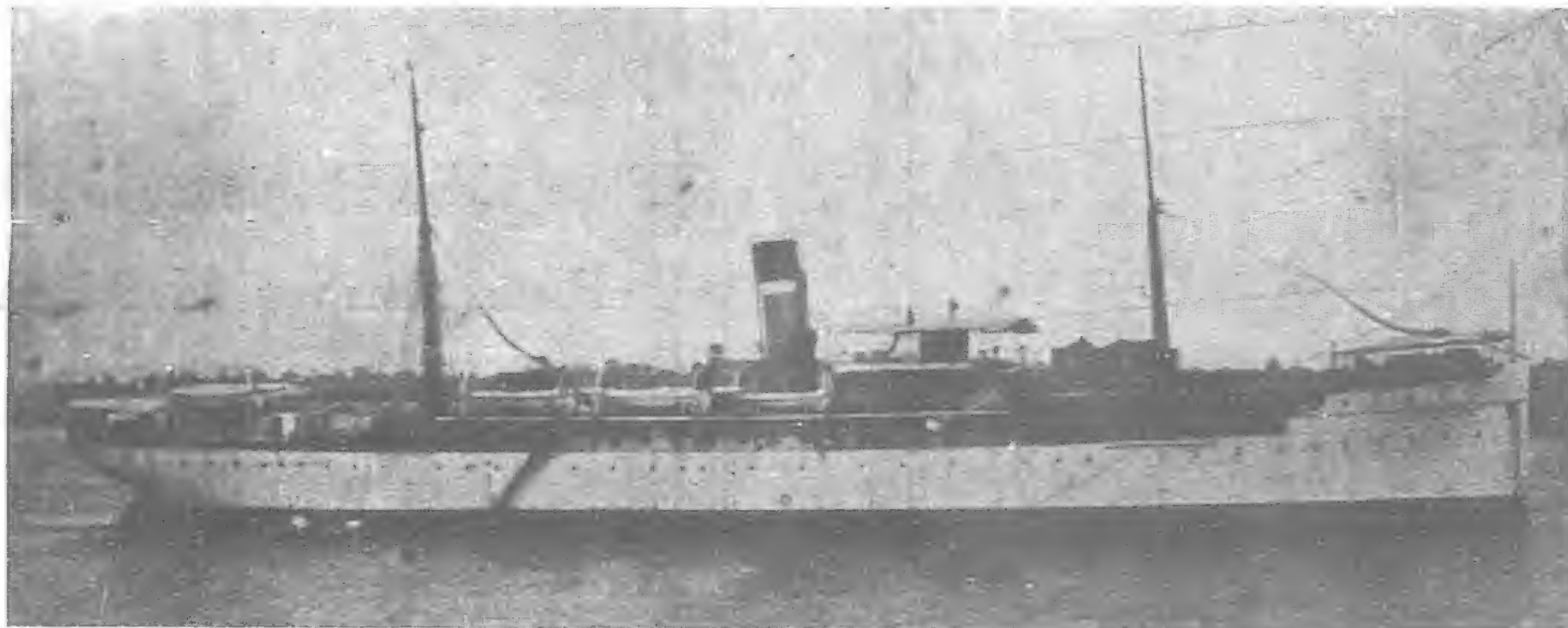
Boilermakers, Dock Proprietors, Shipbuilders, Engineers and Electricians

HEAD OFFICE:

26 Broadway,

Shanghai

Telephone No. 7



U.S. ARMY TRANSPORT "MERRITT," 300' 0" X 45' 0" X 28' 3"

Cable Address
"FARNHAM"Codes Used,
A.B.C. 4th, 5th
& 6th Editions
A-1, Watkin's,
Scott's,
Western Union,
Bentley's
and
Engineering.

The "Merritt" is one of Twenty-Seven Steam Vessels built during the last few years to the order of The American Government for service in the Philippine Islands.

The Docks are four in number, ranging in length from 355 feet to 700 feet on the Blocks, and breadth of entrance from 53 feet to 80 feet, with a depth of water on the sill of from 16 feet to 27 feet.

The Dock charges are the most moderate in the Far East.

The Company's Yards and Docks cover 96 acres. The Water Frontage is about 1½ miles in length. Wharves and Pontoons are arranged where steamers can moor during repairs; and slips for hauling up small vessels are provided. Sheer legs capable of lifting 65 tons are placed at the various Docks.

The extensive Shipbuilding yards and workshops, lit by Electric Light, are provided with the latest improvements, such as travelling cranes of 60 tons' capacity, hydraulic and pneumatic machinery and tools.

Low Pressure Hot Water and Steam Heating Installations

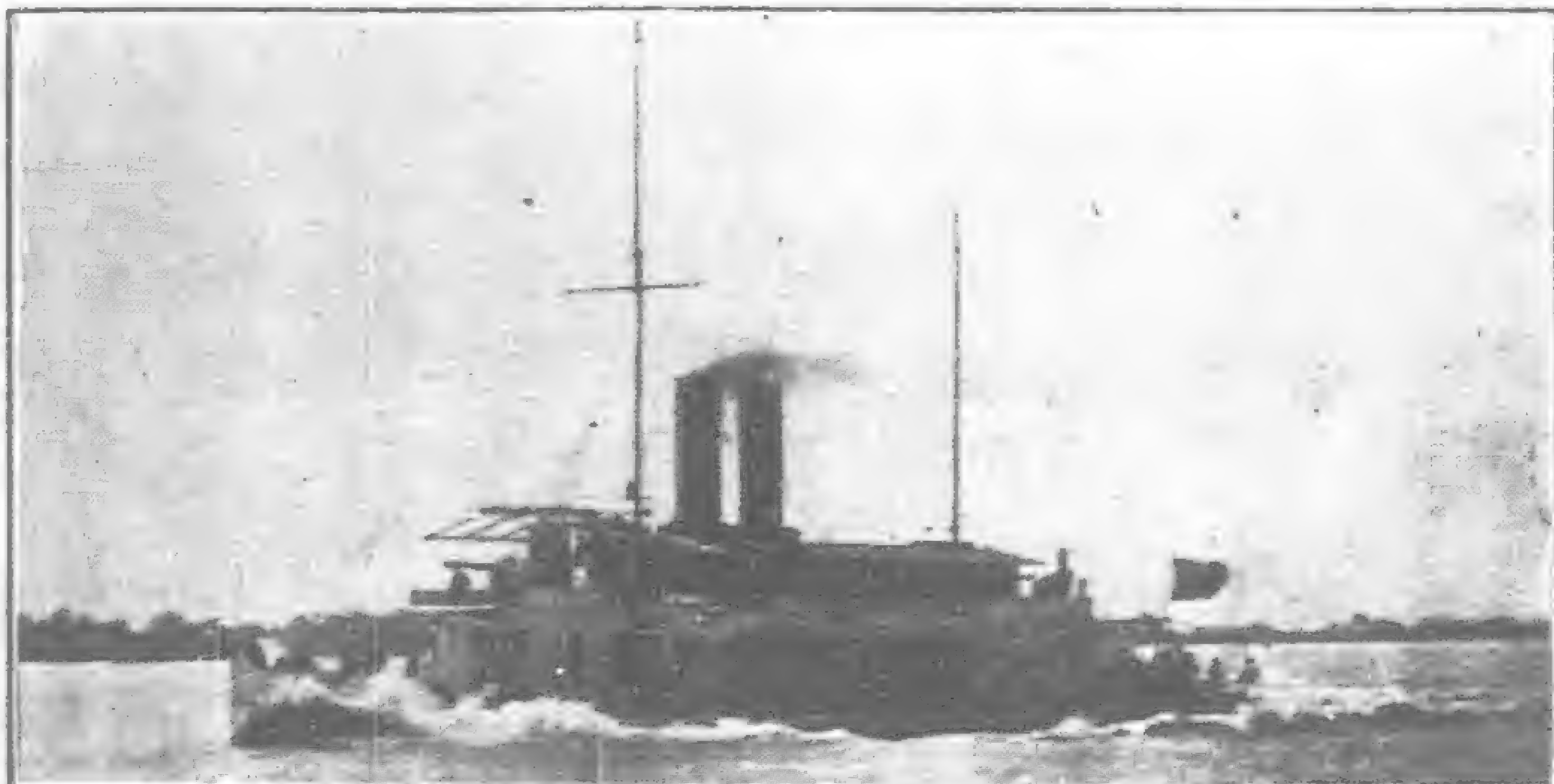
CALL FLAG FOR VESSELS IN SHANGHAI HARBOUR
"F.B." INTERNATIONAL CODE

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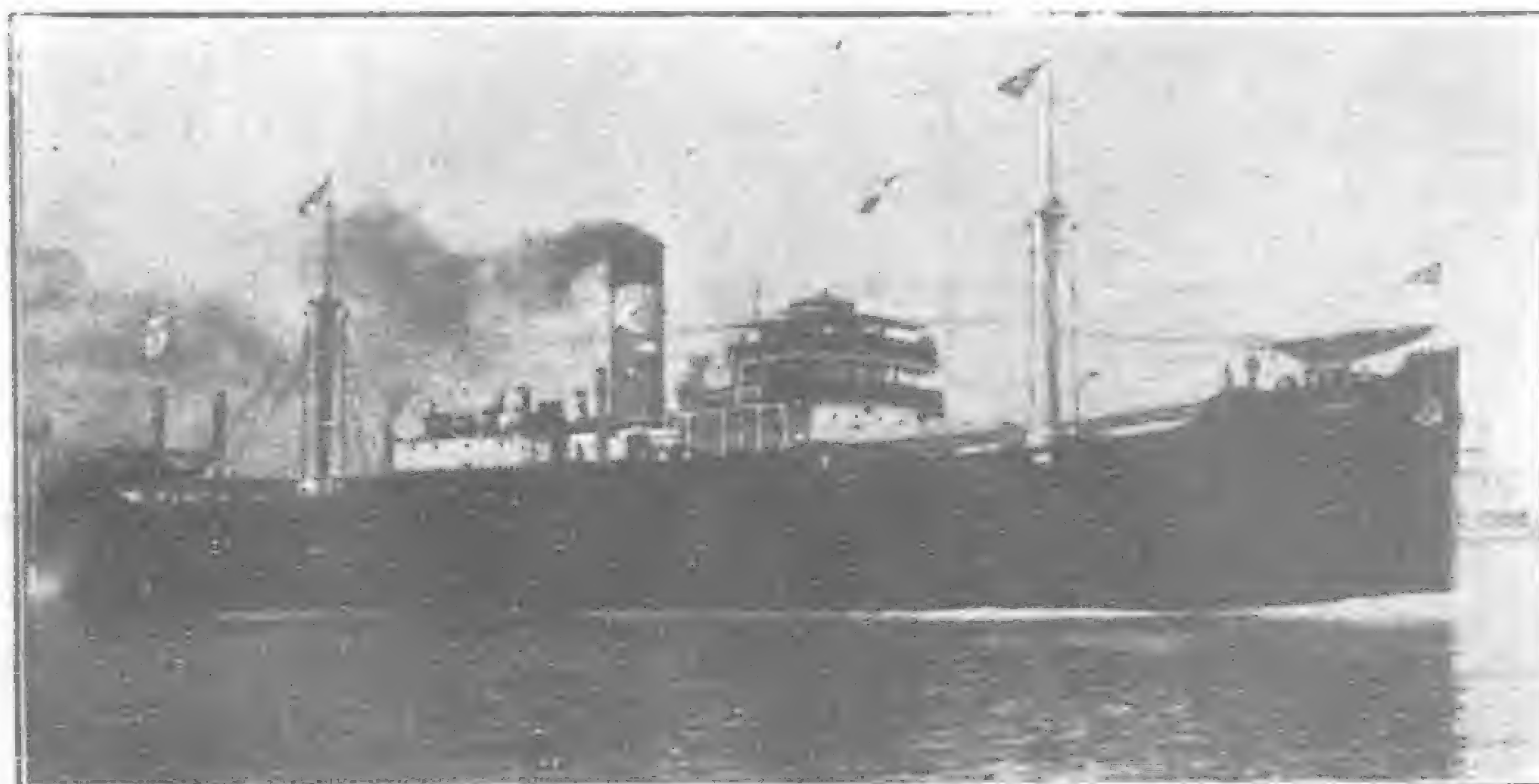
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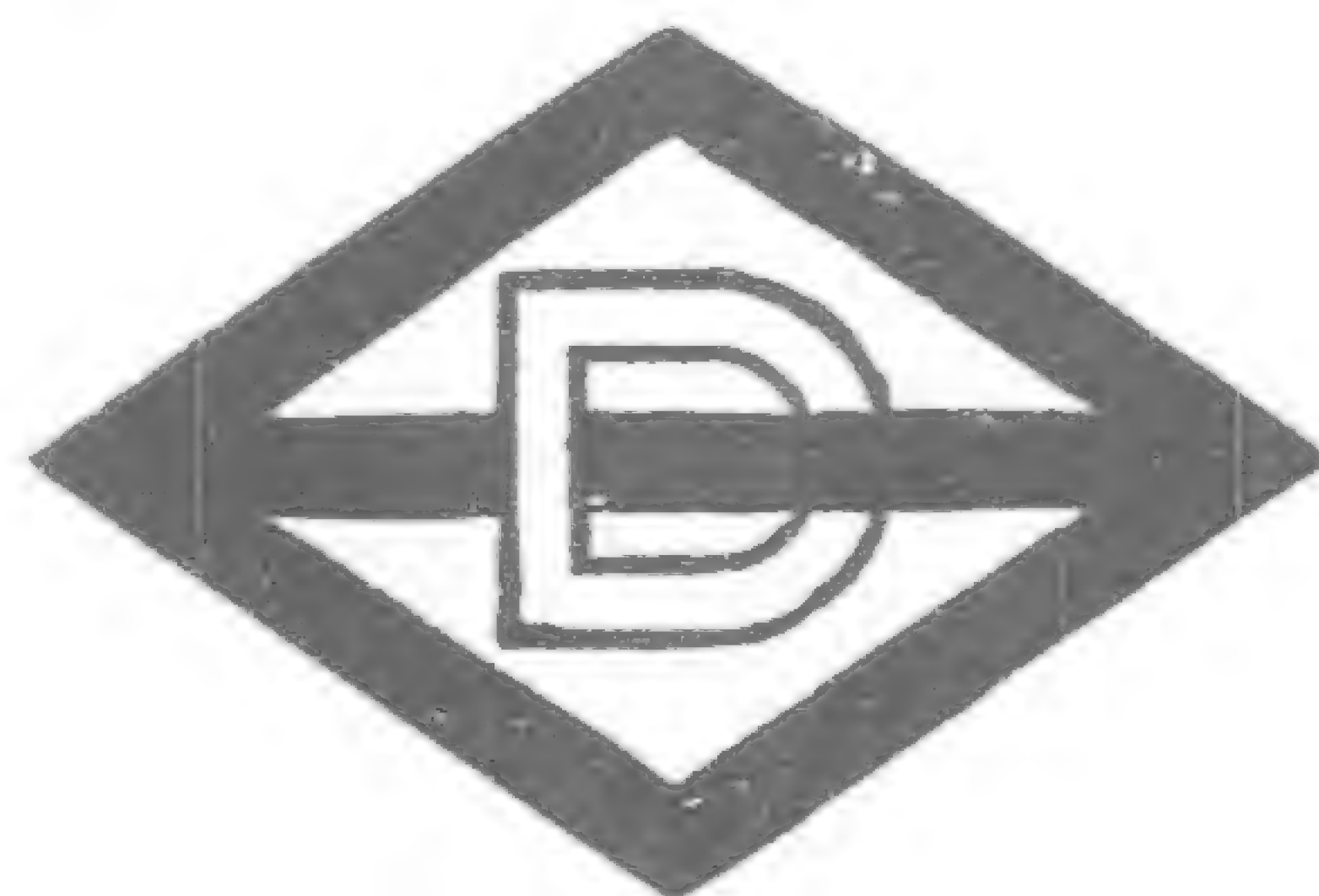
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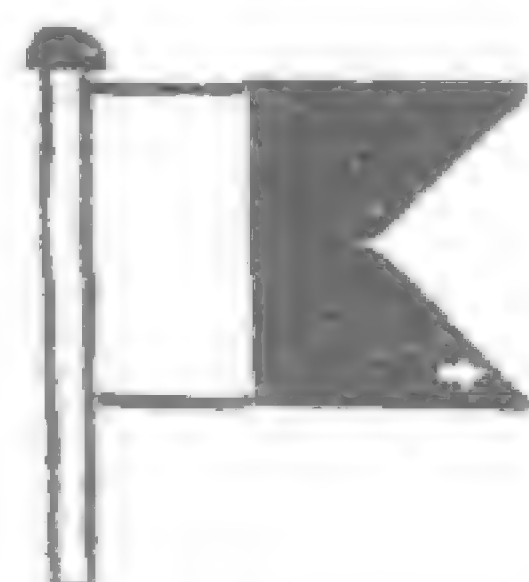
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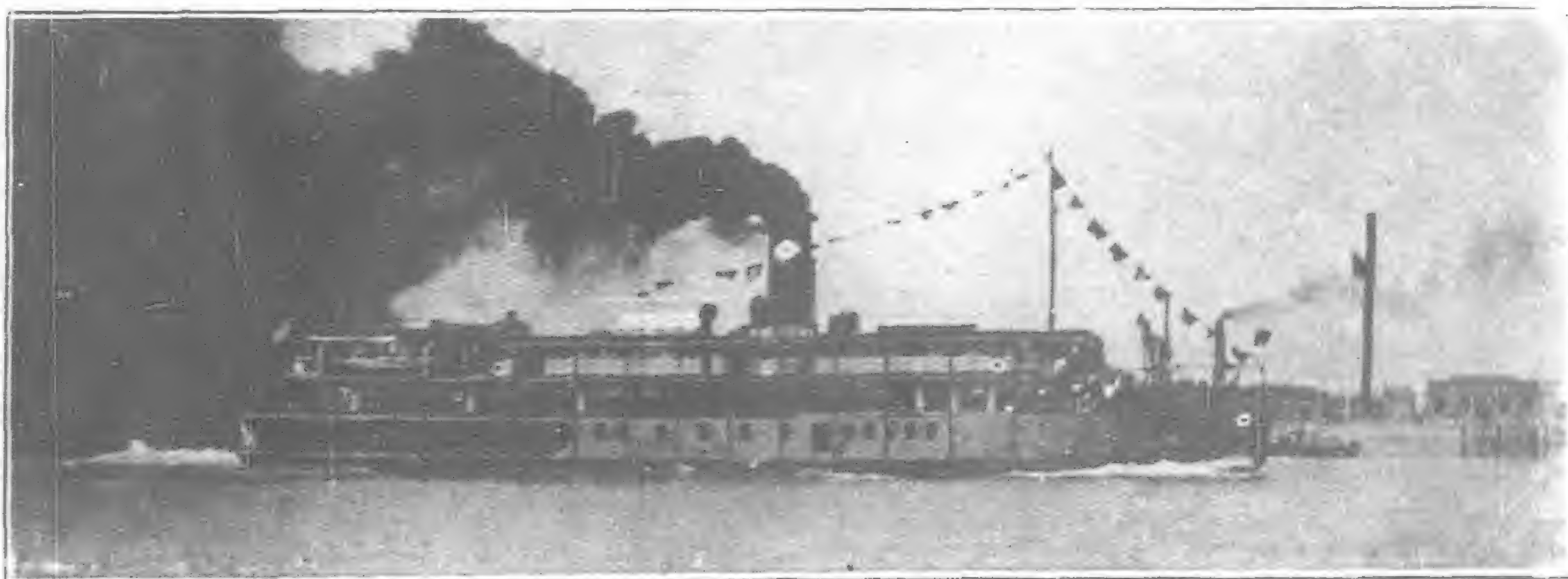
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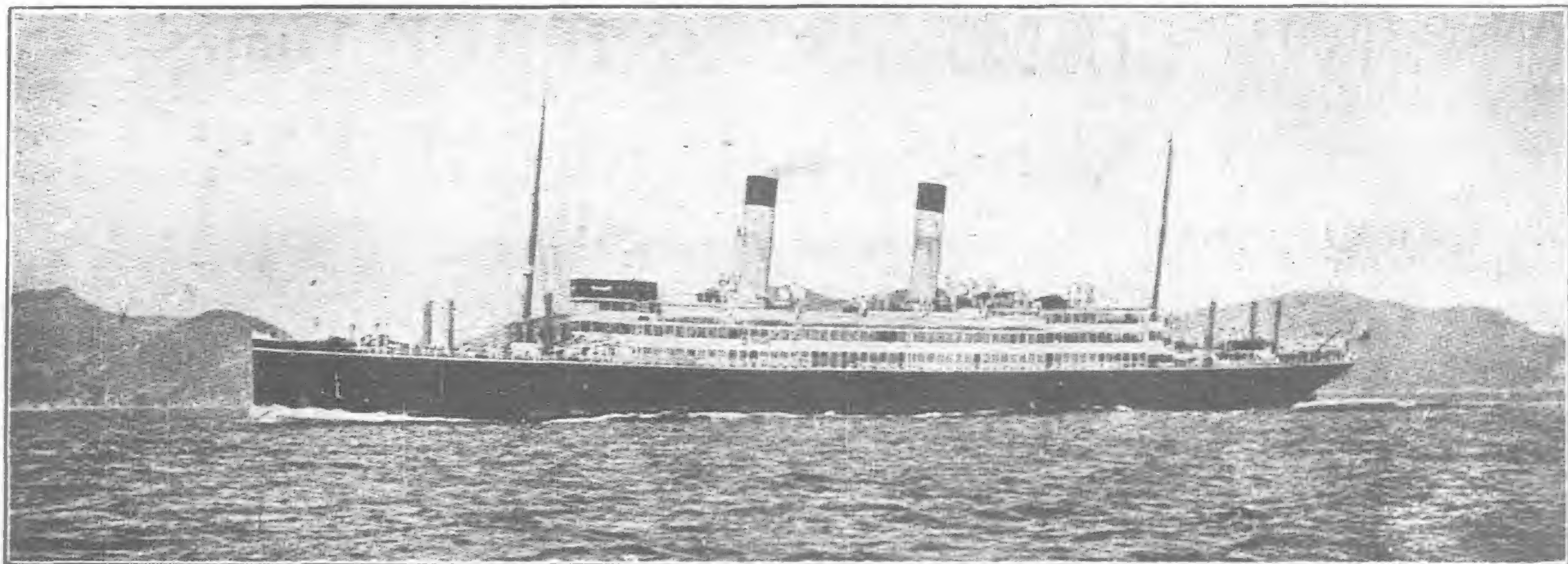
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Width of Entrance on Top	89 "	Width of Entrance on Top	66 "	Width of Entrance on Top	99½ "
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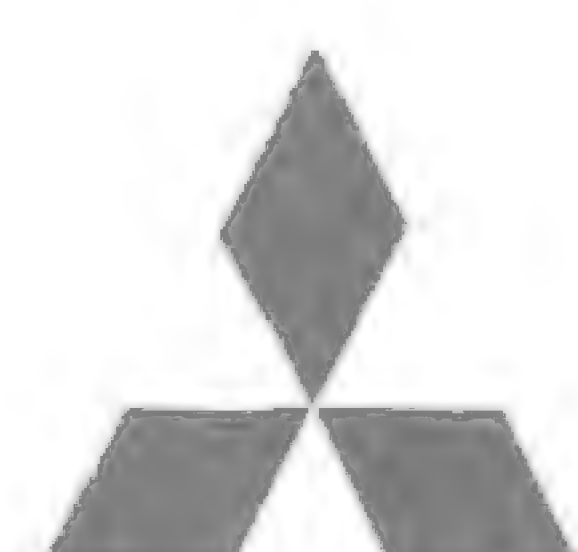
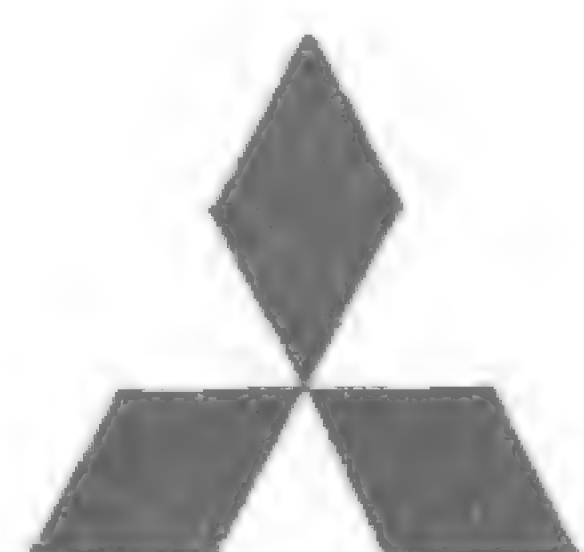
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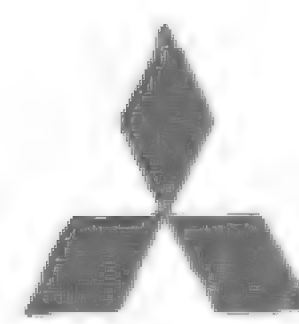
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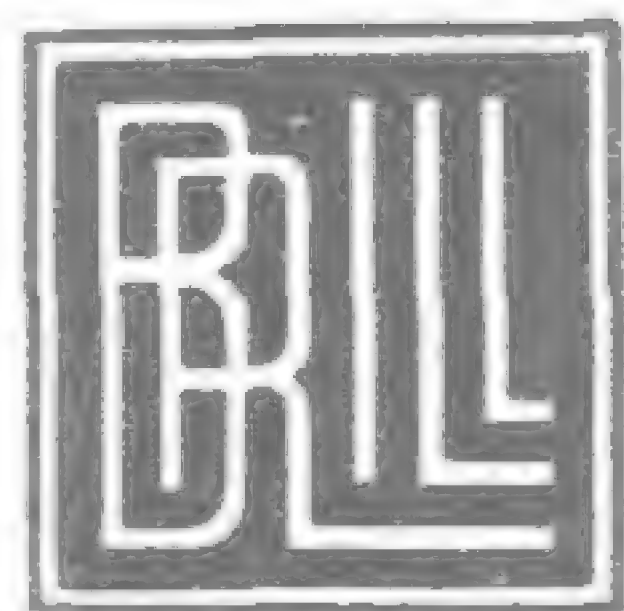
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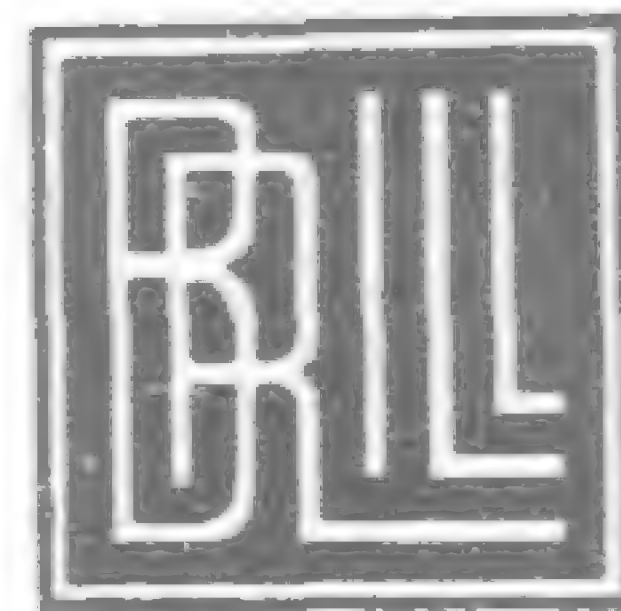
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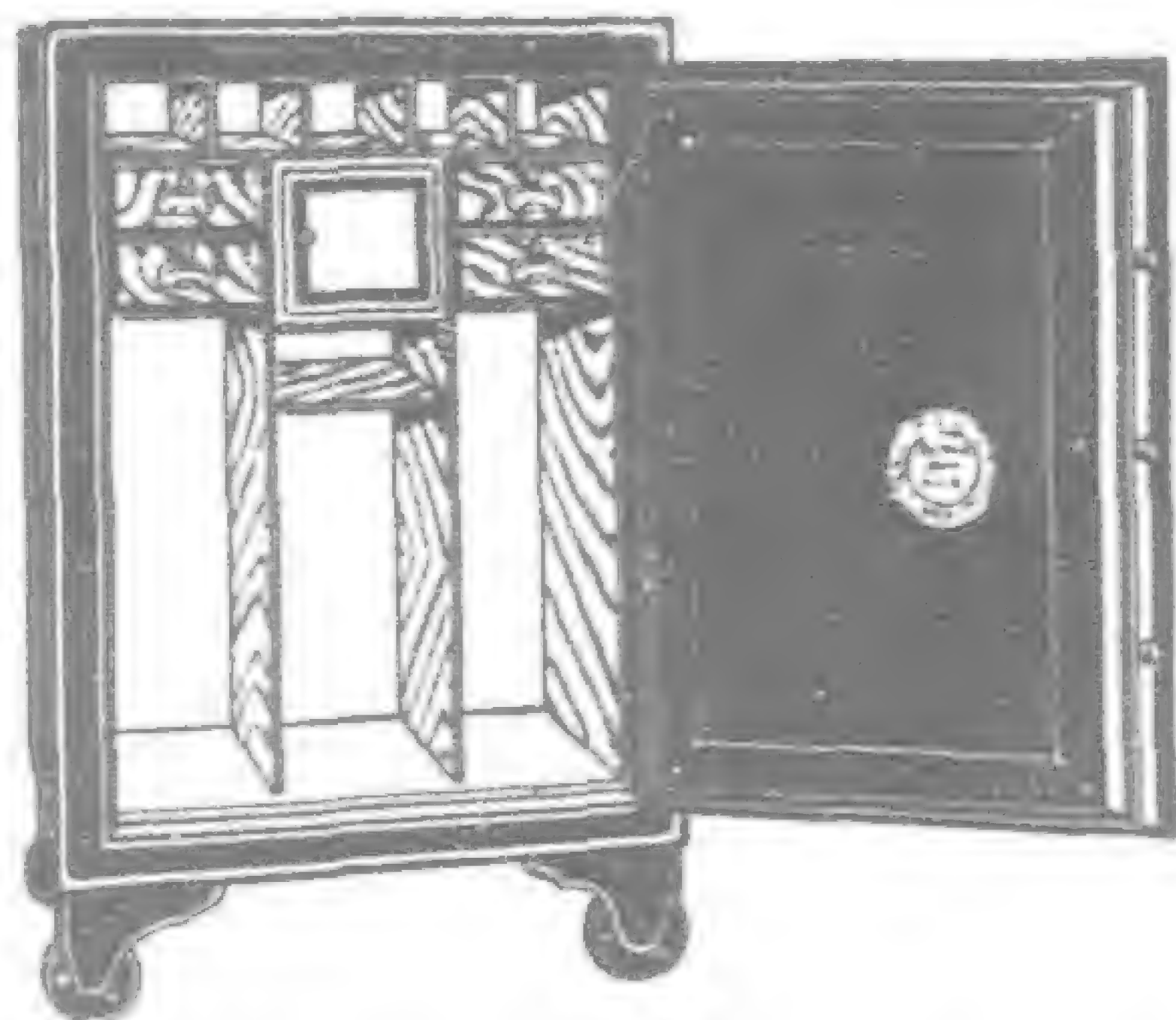


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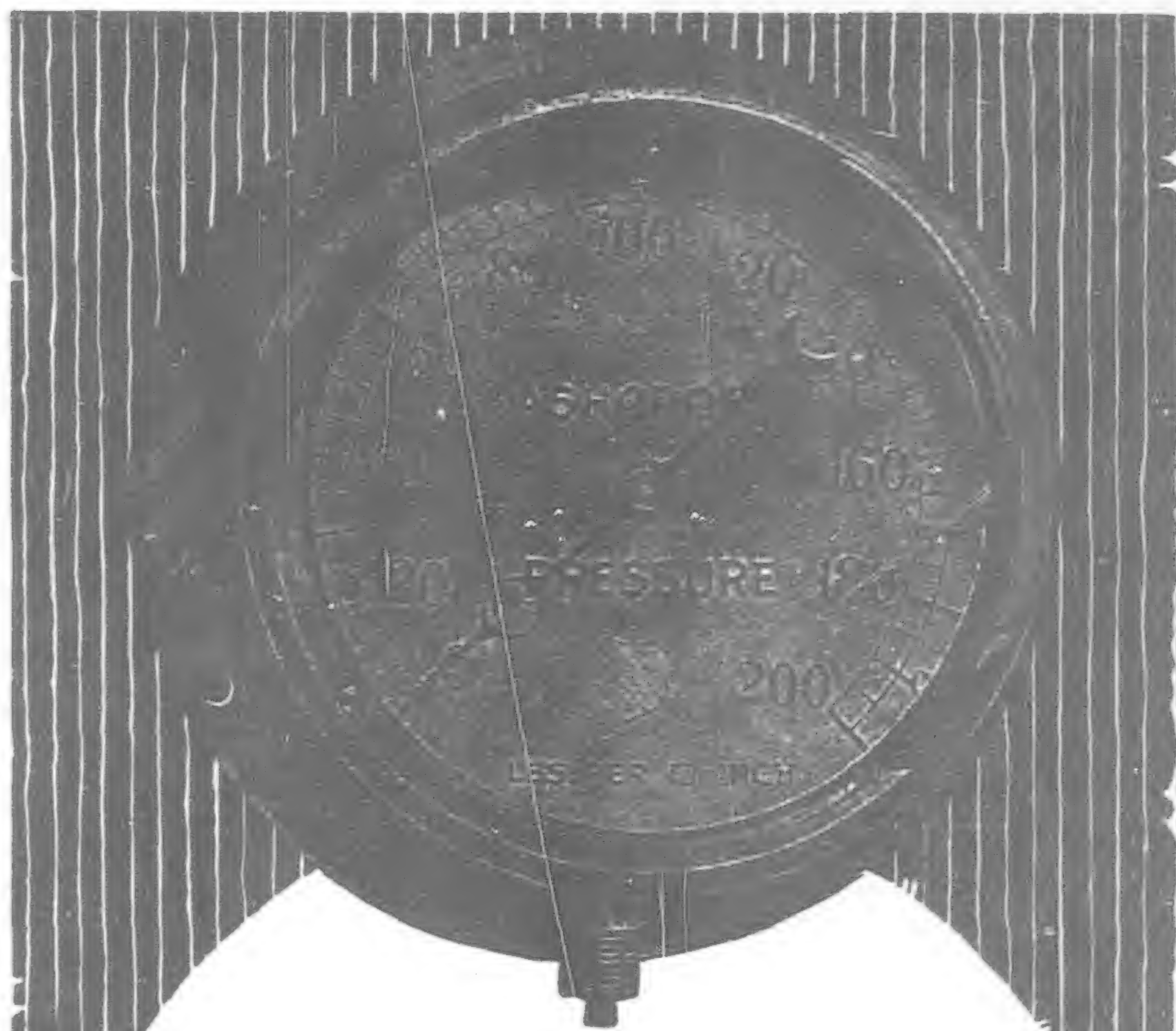
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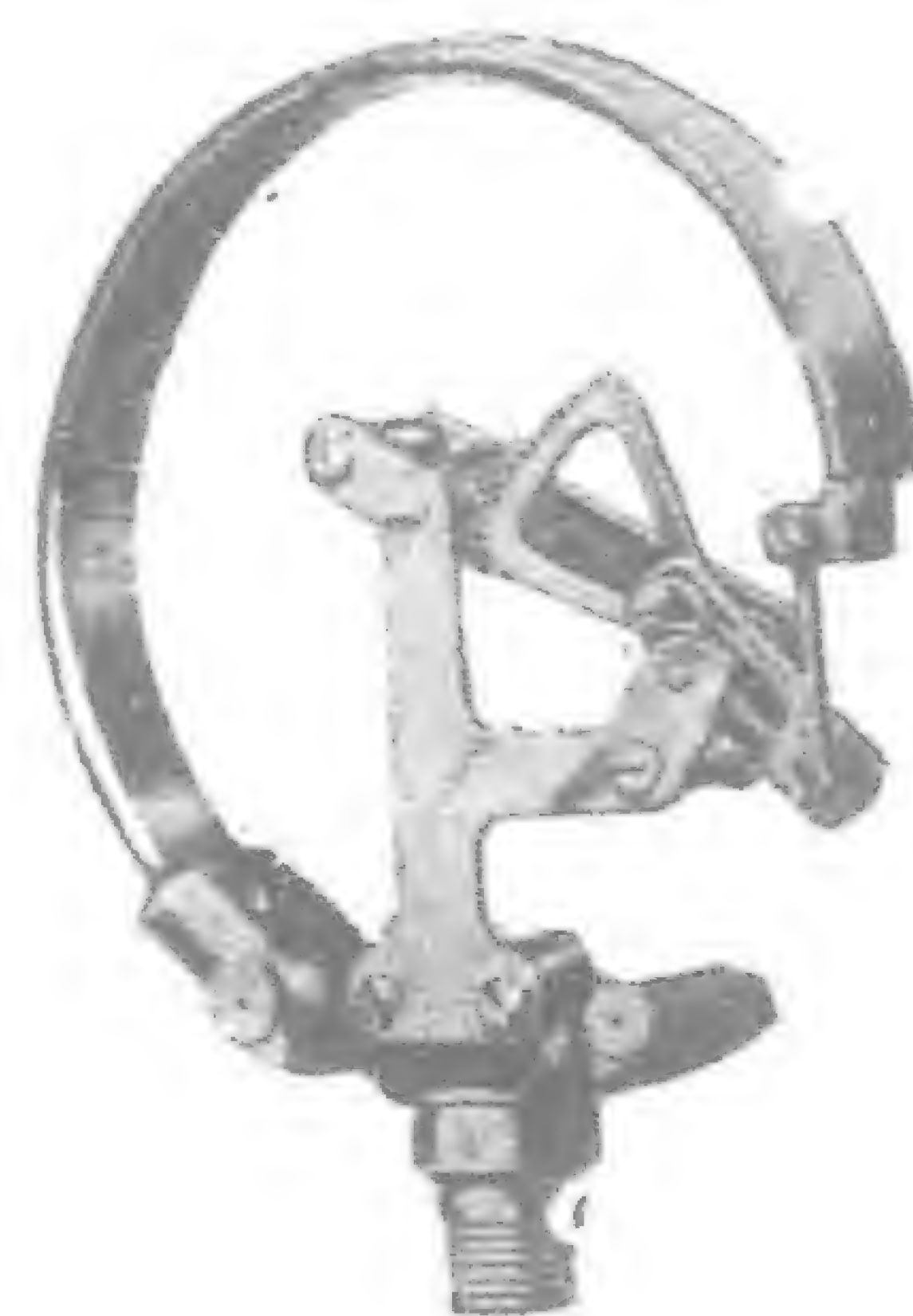
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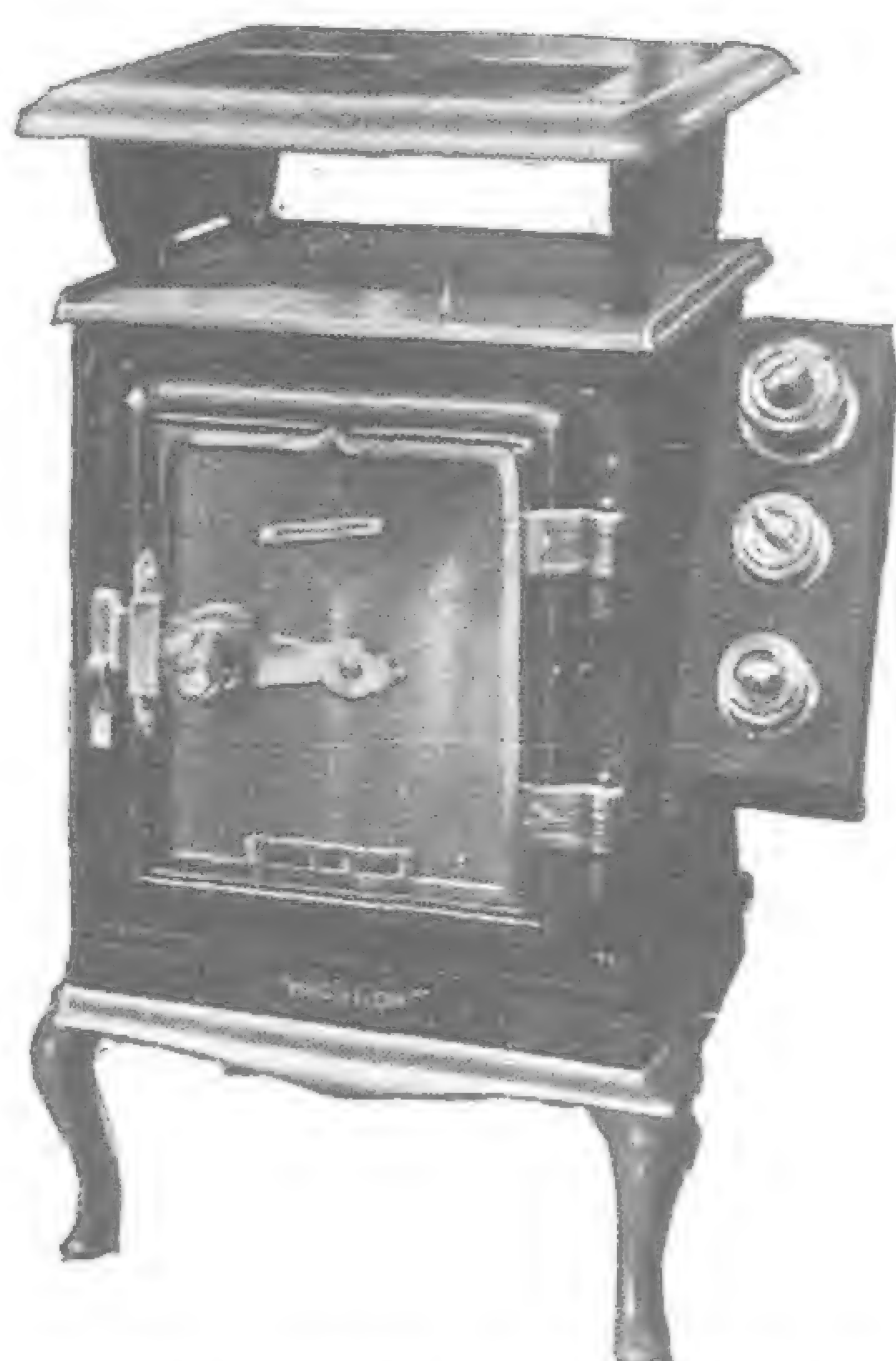
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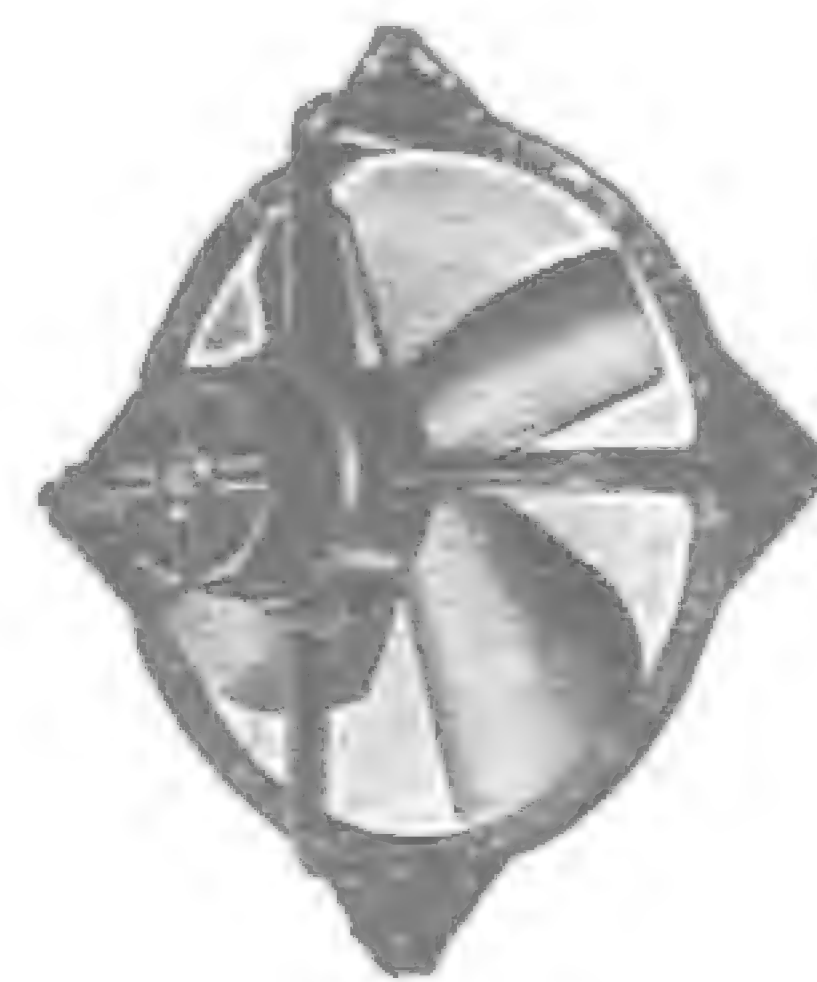
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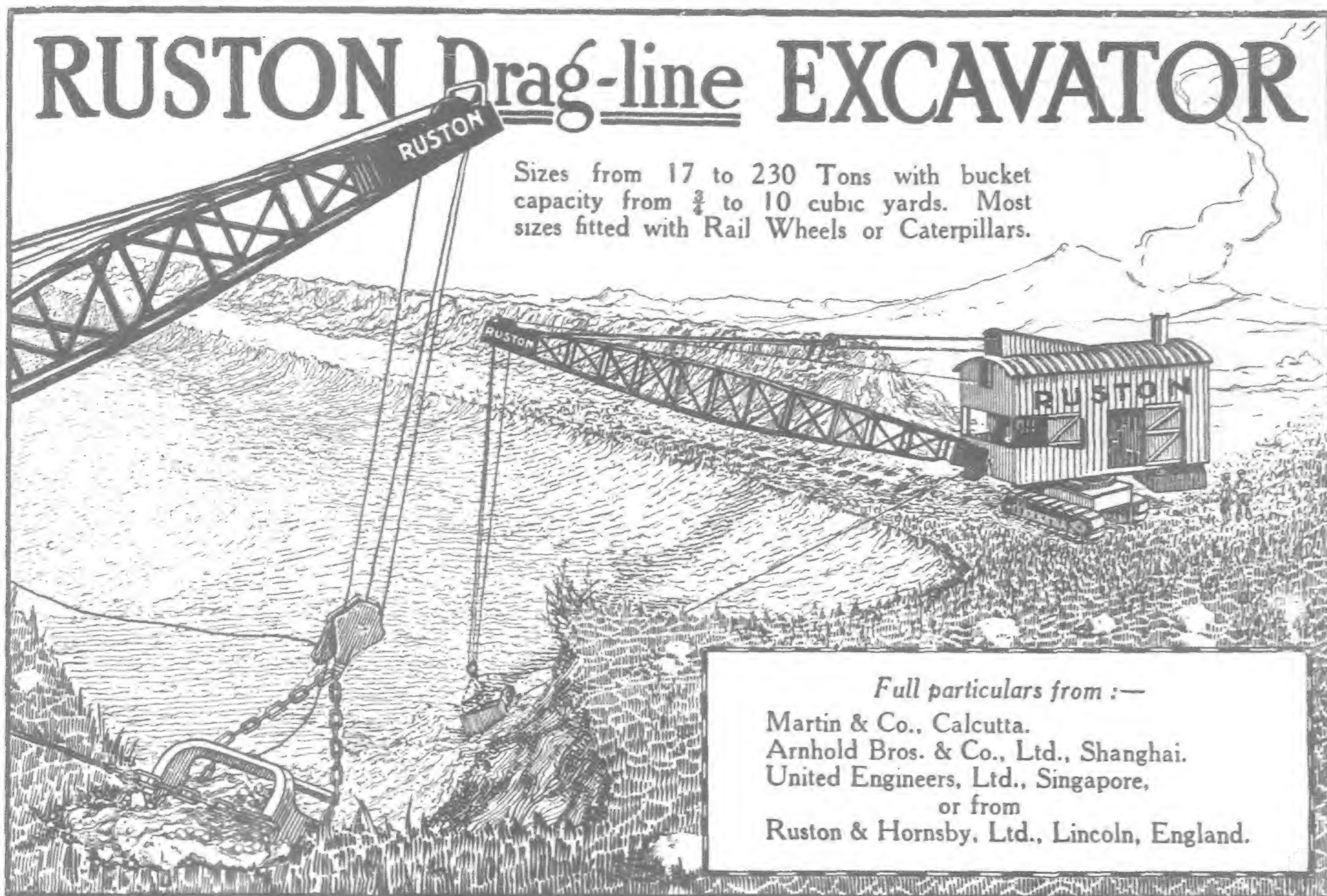
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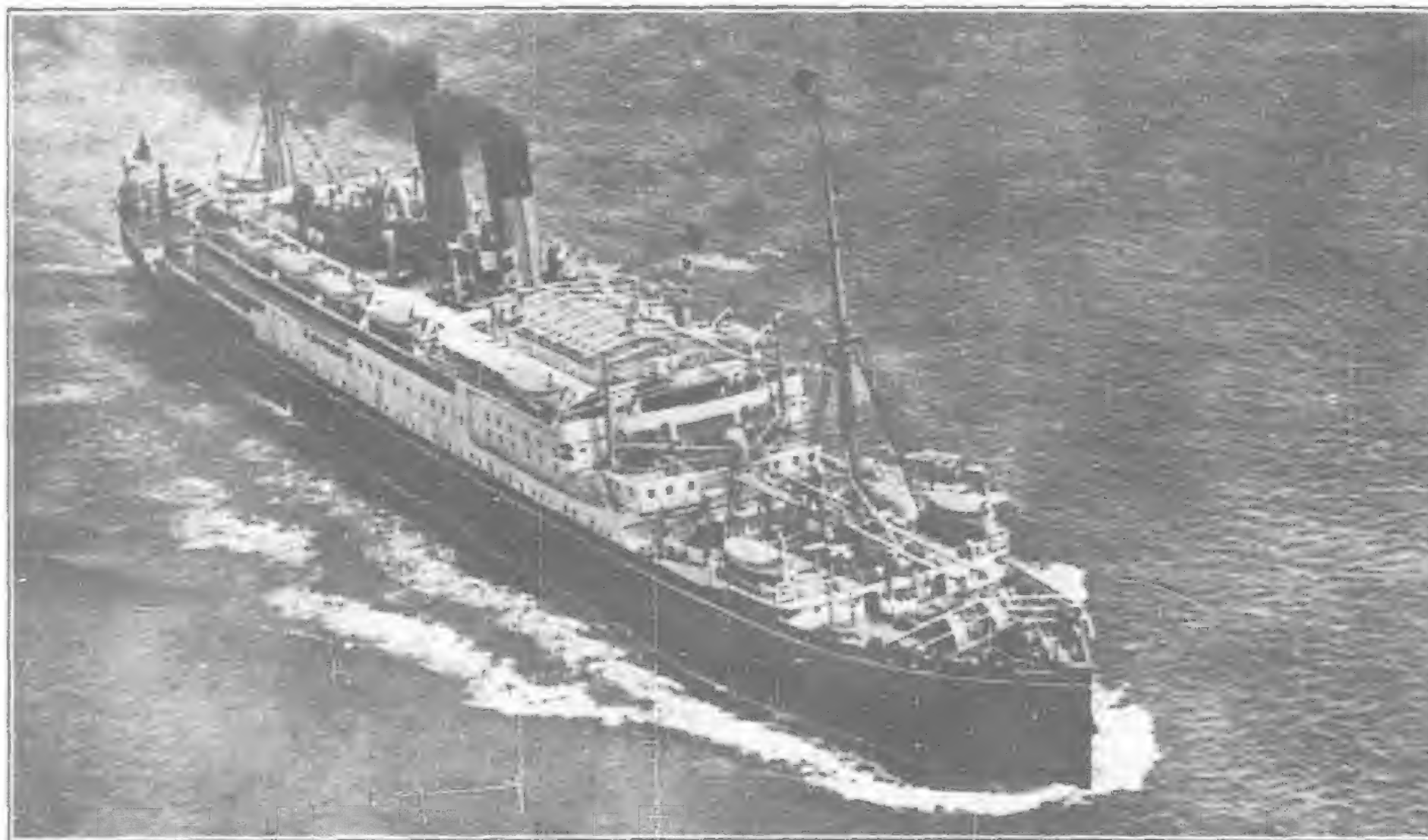
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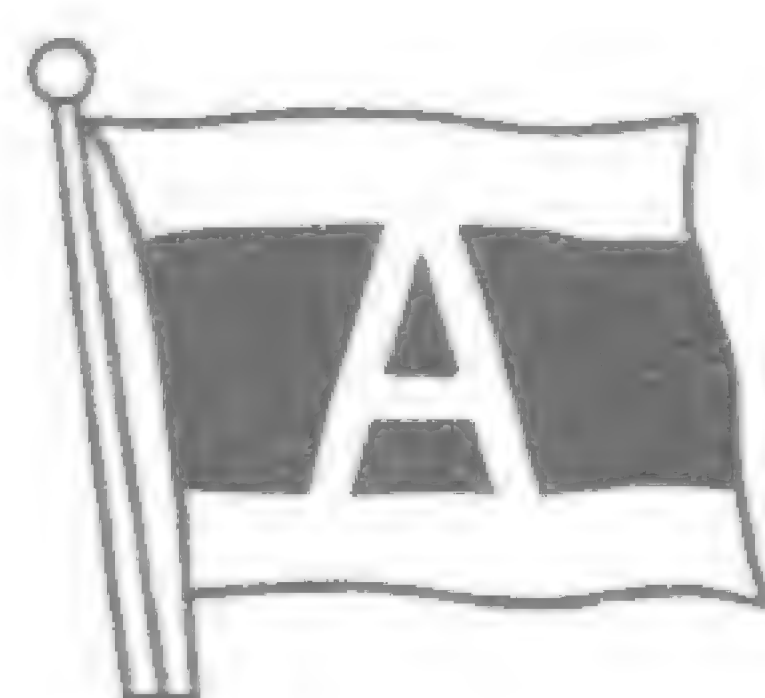
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Co., Ltd.



KOKUSAI KISEN KAISHA

Nominal Capital	-	-	Yen 100,000,000.00
Paid-up Capital	-	-	„ 87,500,000.00
Aggregate Tonnage	-	-	500,000 Tons

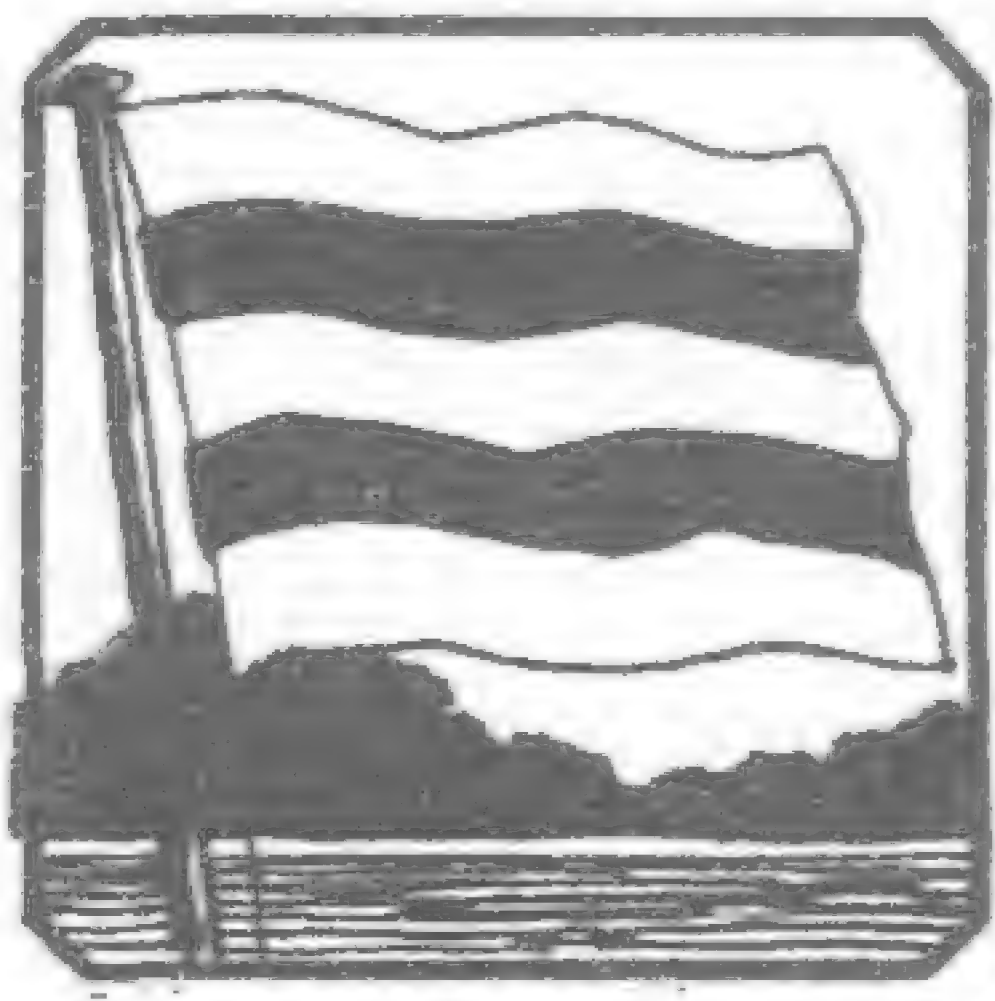
FLEET OF STEAMSHIPS

Name			Tons D.W.	Name			Tons D.W.
Rozan-Marū ...	...	...	8,700	Seifuku-Marū ...	...	...	9,100
Vancouver-Marū ...	...	...	9,100	Suez-Marū ...	...	...	6,600
Boston-Marū ...	...	...	8,800	Daio-Marū ...	...	...	9,000
Tofuku-Marū ...	...	...	9,100	Kashu-Marū ...	...	...	8,800
Chifuku-Marū ...	...	...	9,100	No. 2 Kifunesan-Marū ...	...	...	5,000
Ryufuku-Marū ...	...	...	9,100	Yousan-Marū ...	...	...	5,000
Hankow-Marū ...	...	...	6,400	Taisan-Marū ...	...	...	5,000
Yoni-Marū ...	...	...	11,000	Yuri-Marū ...	...	...	11,000
Taibu-Marū ...	...	...	8,900	Texas-Marū ...	...	...	11,000
San Francisco-Marū ...	...	...	9,100	Tamatsu-Marū ...	...	...	6,600
Naple-Marū ...	...	...	9,100	Eifuku-Marū ...	...	...	9,100
Glasgow-Marū ...	...	...	9,100	Kifuku-Marū ...	...	...	9,100
Yayoi-Marū ...	...	...	8,700	Toyofuku-Marū ...	...	...	9,000
Yaye-Marū ...	...	...	11,000	Raifuku-Marū ...	...	...	9,100
Malta-Marū ...	...	...	8,700	Keifuku-Marū ...	...	...	9,100
Buyo-Marū ...	...	...	8,800	Washington-Marū ...	...	...	9,100
Brazil-Marū ...	...	...	9,100	Tokufuku-Marū ...	...	...	9,100
Kofuku-Marū ...	...	...	9,100	Portland-Marū ...	...	...	9,100
Yezari-Marū ...	...	...	6,900	England-Marū ...	...	...	9,100
Yugao-Marū ...	...	...	5,000	Chili-Marū ...	...	...	9,100
Yubaye-Marū ...	...	...	5,000	Argentine-Marū ...	...	...	9,100
Sydney-Marū ...	...	...	6,400	Port Said-Marū ...	...	...	9,100
Shanghai-Marū ...	...	...	6,400	New York-Marū ...	...	...	9,100
Singapore-Marū ...	...	...	9,100	Karorin-Marū ...	...	...	6,400
Jyufuku-Marū ...	...	...	9,100	Tasmania-Marū ...	...	...	6,400
Hiyeizan-Marū ...	...	...	6,700				

Head Office : No. 8 Kaigan-dori, Kobe

BRANCH OFFICE :

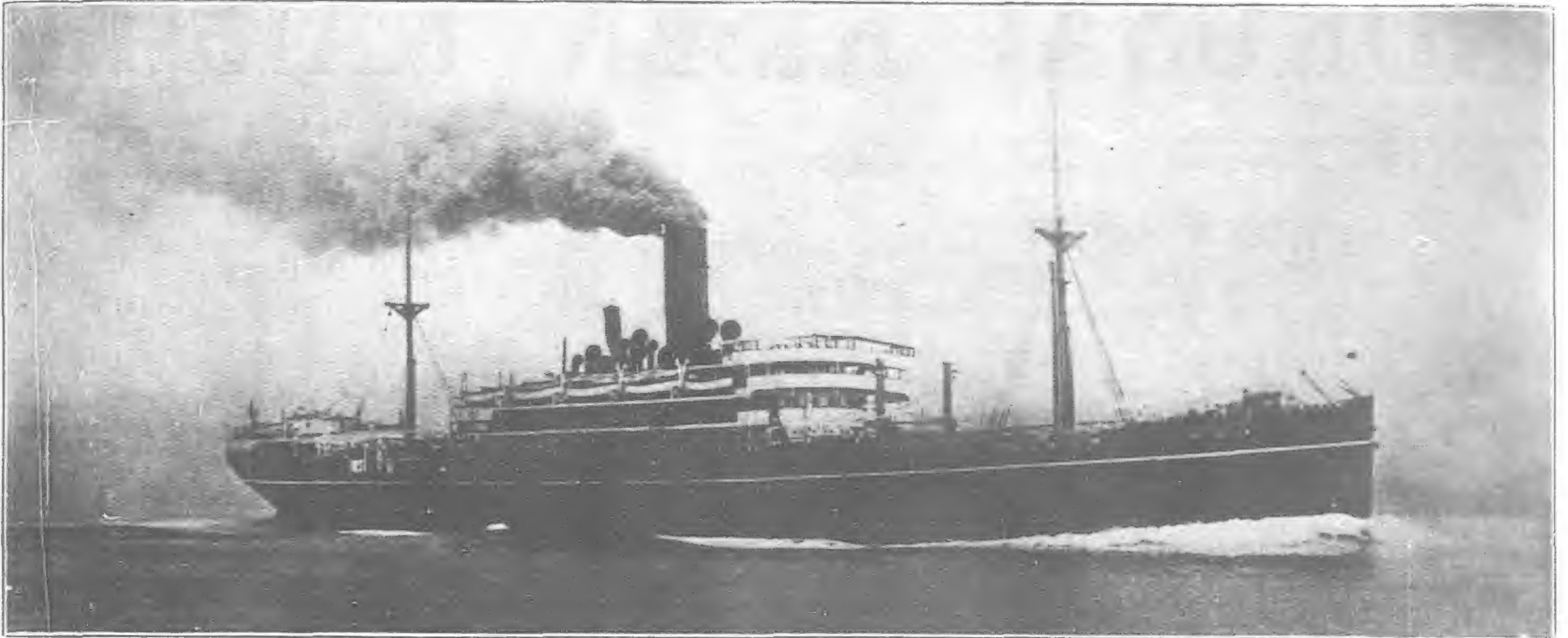
Tokyo Kaijo Building, Maruno-uchi, Tokyo, Japan



NIPPON YUSEN KAISHA



HEAD OFFICE. TOKYO, JAPAN



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OVER THE

THE PALATIAL STEAMERS OF THE N.Y.K.

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WEST COAST LINE (Monthly).

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SINGAPORE, HONGKONG, SHANGHAI AND JAPAN.

NORTH CONTINENTAL LINE (Monthly).

HAMBURG, GRANGEMOUTH, ROTTERDAM AND ANTWERP.
STRAITS, JAVA, CHINA AND JAPAN.

NORTH AMERICAN LINE (Every 3 Weeks).

HONGKONG, MANILA, SHANGHAI, KOBE AND YOKOHAMA.
VICTORIA, B.C., AND SEATTLE.

SOUTH AMERICAN LINE (Every 2 Months)

KOBE, SINGAPORE, DURBAN AND CAPETOWN.
SANTOS, RIO DE JANEIRO AND BUENOS AIRES.

AUSTRALIAN LINE (Monthly).

YOKOHAMA, KOBE, HONGKONG, MANILA, ZAMBOANGA, THURSDAY ISLAND, TOWNSVILLE, BRISBANE, SYDNEY AND MELBOURNE.

BOMBAY LINE (Fortnightly).

KOBE, SHANGHAI, HONGKONG, SINGAPORE, MALACCA, COLOMBO, TUTICORIN AND BOMBAY.

CALCUTTA LINE

(FORTNIGHTLY) YOKOHAMA, KOBE, HONGKONG, SINGAPORE
PENANG, RANGOON AND CALCUTTA.
(MONTHLY) CALCUTTA, MADRAS, COLOMBO, SUEZ, PORT SAID,
ALGIERS AND NEW YORK.

NEW YORK-FAR EAST LINE (Fortnightly)

KOBE, YOKOHAMA, SAN FRANCISCO, PANAMA, COLON, HAVANA
AND NEW YORK.
NEW YORK TO JAPAN, CHINA AND PHILIPPINES.



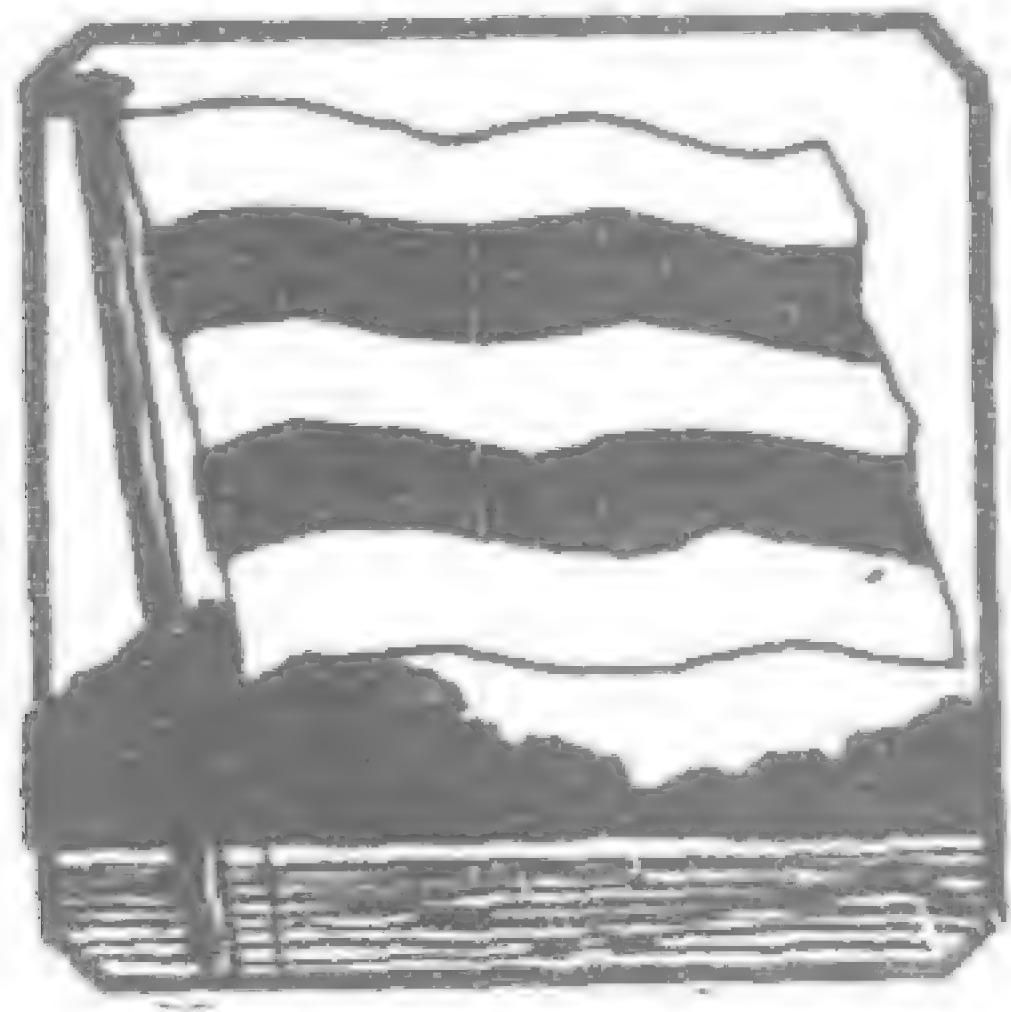
Smoking Room



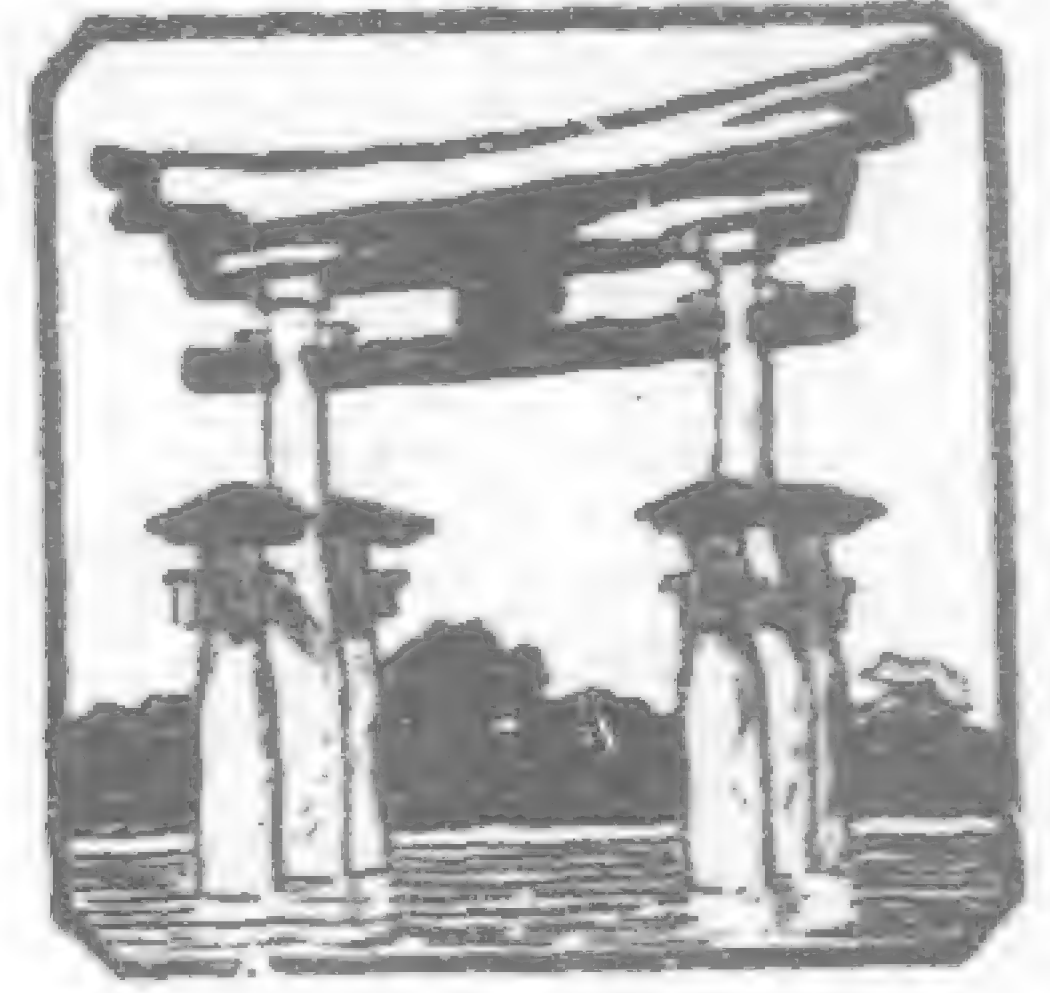
Dining Saloon



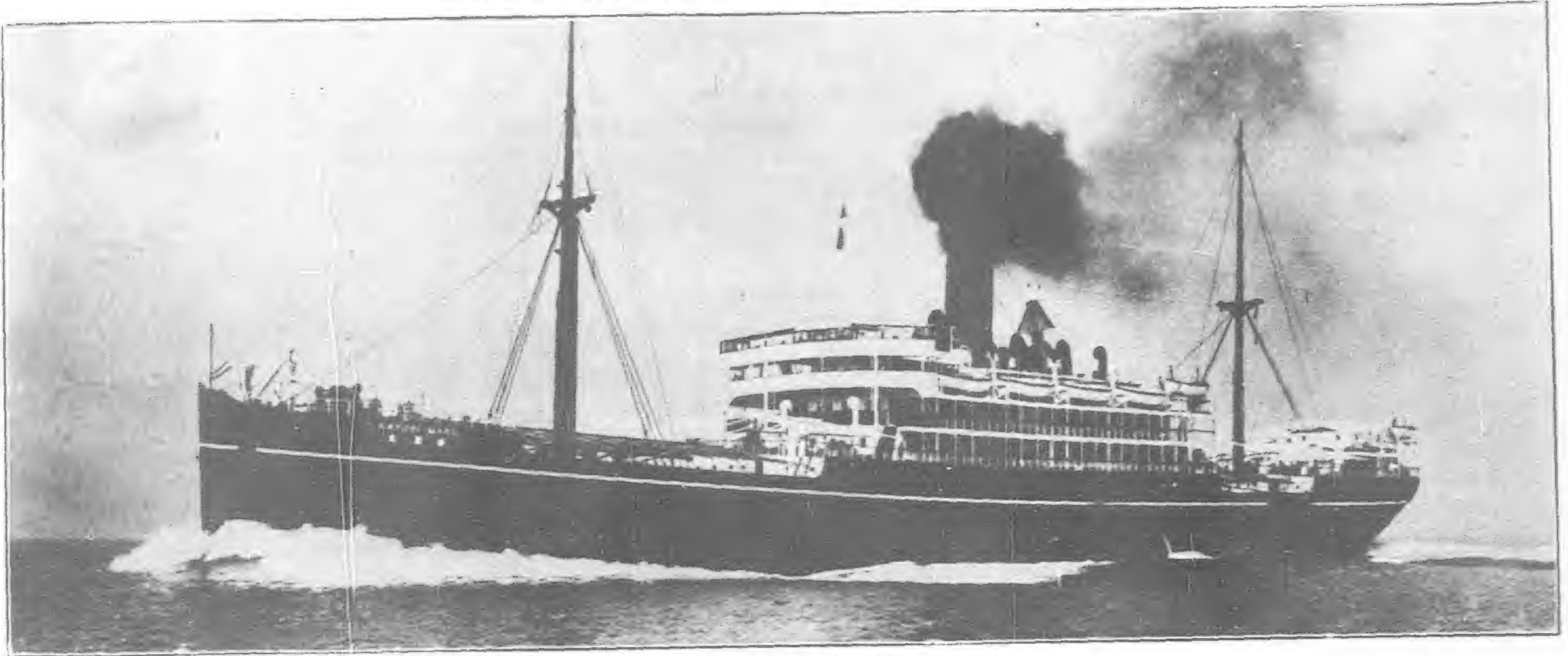
Social Hall



NIPPON YUSEN KAISHA



FLEET: 114 STEAMERS, 574,594 GROSS TONS



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SHIPPERS WILL FIND QUICK DISPATCH, WITH WHARF, WAREHOUSE AND TERMINAL FACILITIES AT ALL PRINCIPAL PORTS SERVED BY N.Y.K. STEAMERS

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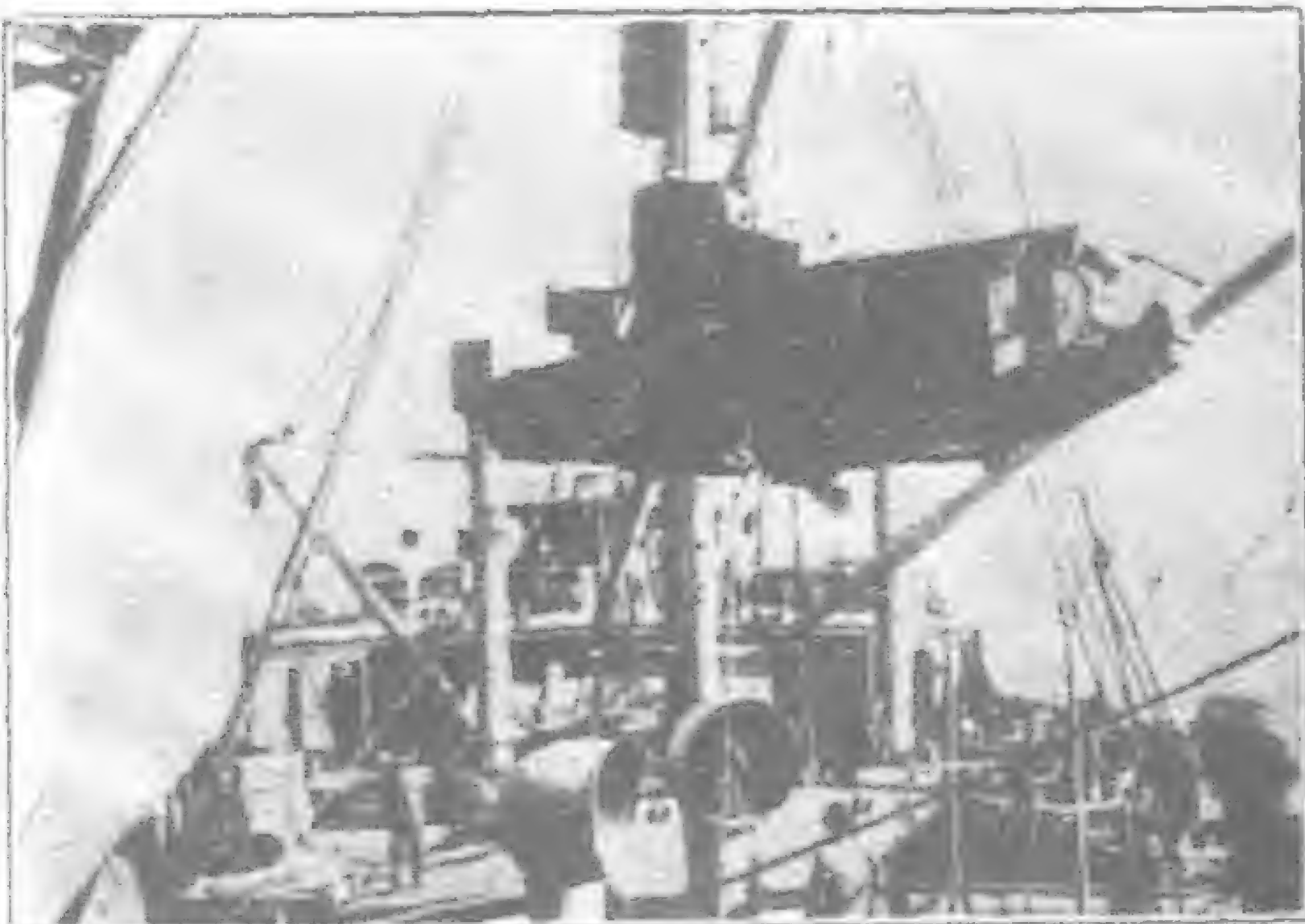
Yokohama
Kobe
Hakodate
Tsingtao
Penang
Port Said
Antwerp
Seattle
Sydney

Tokio
Moji
Otaru
Hongkong
Colombo
Marseilles
Rotterdam
Manila
Melbourne

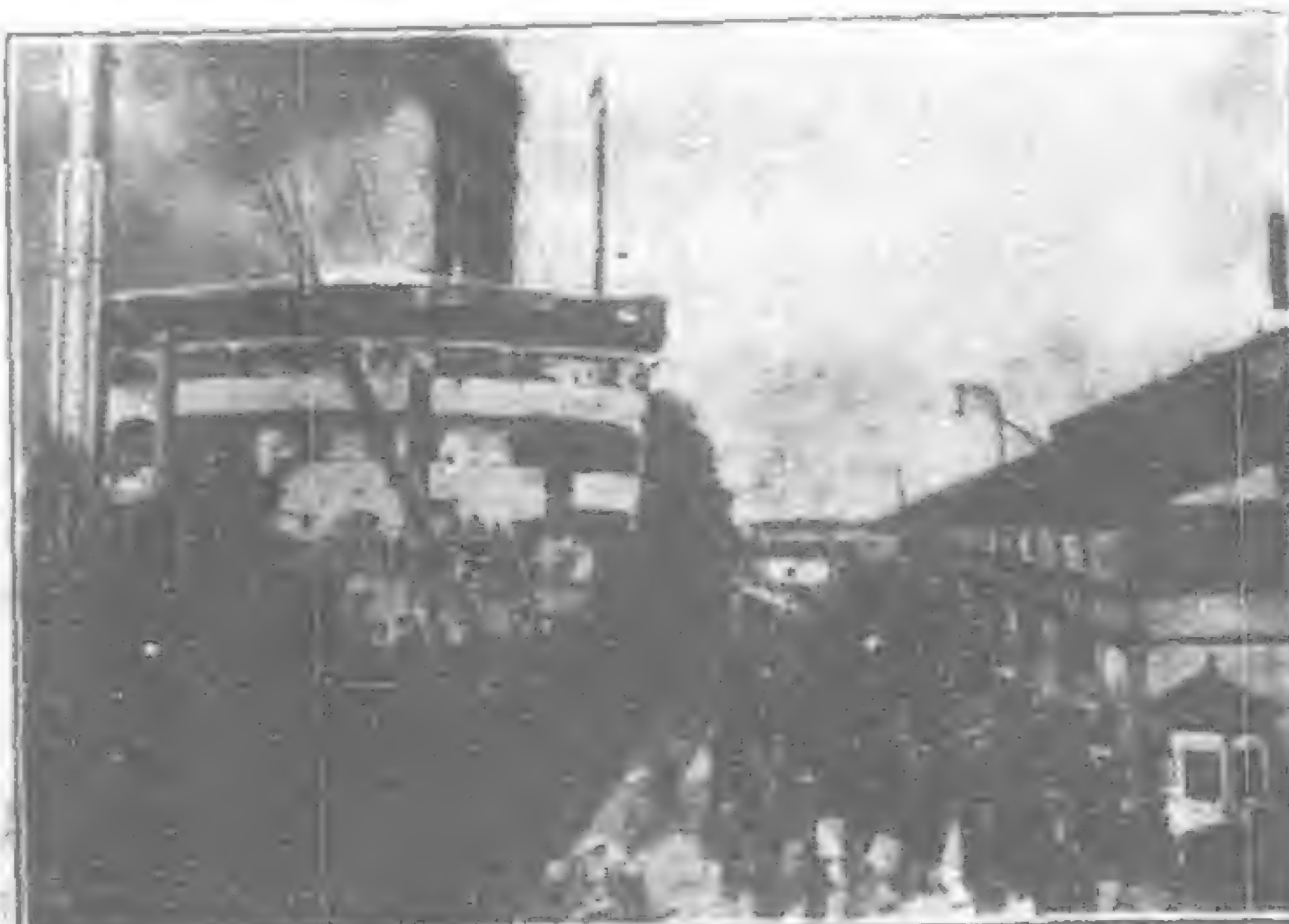
Nagoya
Nagasaki
Tientsin
Canton
Calcutta
London
New York
Townsville
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Keelung
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Bombay
Liverpool
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Dock at Yokohama



Great Northern Dock at Seattle

Chartered Bank of India, Australia and China

INCORPORATED BY ROYAL CHARTER, 1853

Capital	£3,000,000
Reserve Fund	£3,700,000
Reserve Liabilities of Shareholders	£3,000,000

Head Office: 38 BISHOPSGATE, LONDON, E.C.

Shanghai Branch: 18 THE BUND.

Court of Directors:

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THE LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.

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Amritsar	Calcutta	Delhi	Ipoh	(F.M.S.)	Peking	Seremban	Tavoy
Bangkok	Canton	Haiphong	Karachi	Madras	Penang	Shanghai	L. Burma
Batavia	Cawnpore	Hankow	Klang	Manila	Puket	Singapore	Tientsin
	Cebu	Hongkong	Kobe	Medan	Rangoon	Sourabaya	Yokohama

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C. J. SCOTT,
Manager.

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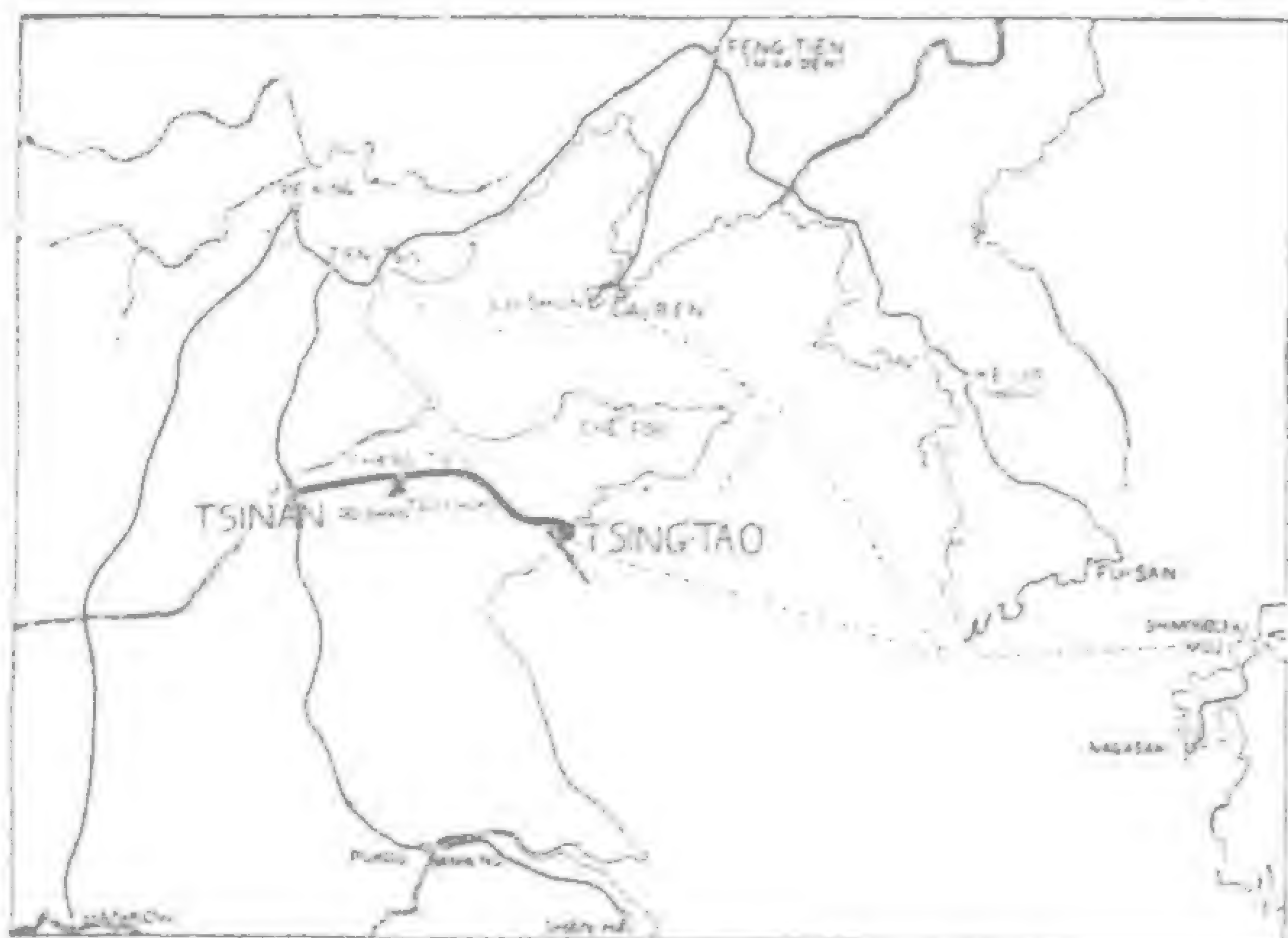
Telegrams: "Attwaters, Preston"

Telephone No.: 1045 (2 lines)

Codes: 5th Edition A.B.C., and Western Union

SHANTUNG RAILWAY

The Shortest Route between Japan and North China



THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tichling, Kaiyuan, Changchun, Penchiu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway. At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 10.00 p.m. arrives Tsinan 8.00 a.m.

Train No. 3 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.40 p.m.

Train No. 2 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 8.35 a.m.

Train No. 4 leaves Tsinan daily 10.10 a.m. arrives Tsingtao 8.20 p.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, \$14.30; 2nd class, \$7.20.

First Class Sleeping Car—A first-class sleeping car is attached to night tr. ins Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea. The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

The hotel rates are \$8.00 and up, per day, on the American plan.



TSINGTAO STATION

For Further Information, please apply to

THE SHANTUNG RAILWAY ADMINISTRATION, TSINGTAO

CABLE ADDRESS: "SANTETSU"

CODES: A.B.C. 5TH ED. & AL.

NIPPON

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SHANGHAI OFFICE: 8 Hankow Road

TIENTSIN OFFICE: 42 Rue de France, French Concession

Capital Subscribed-	-	-	-	-	-	-	-	-	-	Yen 50,000,000.00
Capital paid-up	-	-	-	-	-	-	-	-	-	Yen 20,250,000.00
Reserve Funds	-	-	-	-	-	-	-	-	-	Yen 26,825,000.00

MATAZO KITA, Esq., *President*

ATUSHI YAMADA, Esq., *Vice-President*

Directors :

K. SUYEYOSHI, Esq.

G. IMAMURA, Esq.

R. NAKAMURA, Esq.

H. OHOKA, Esq.

T. SHIKATA, Esq.

K. KUSUMOTO, Esq.

T. YASUI, Esq.

BRANCHES: Semba (Local), Dairen, Shanghai, Hankow and Bombay

AGENCIES: Kobe, Yokohama, Tokyo, Seito, Tientsin, Newchwang, Tiehling, Changchung, Harbin, Hongkong, Calcutta, Karachi, Rangoon, Alexandria, Liverpool, New York and Buenos Aires

SOLE BUYING AGENCY IN U.S.A.: Japan Cotton Trading Company of Texas, Fort Worth, Texas

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home. In the case of the Statler-operated hotels, see any office of Messrs. Thos. Cook & Son; or

the principal hotels and steamship offices in the larger cities of the Orient; or the offices of the Asia Banking Corporation in Shanghai, Hong Kong, Peking, Tientsin, Hankow, Canton, Singapore or Manila. Reservations so made can be depended upon absolutely.

Hotels Statler and Hotel Pennsylvania (Statler-operated) are the preferred hotels of thousands of world travelers who appreciate the luxurious appointments, the complete service, and the real interest the management takes in the comfort and convenience of its guests.

It will cost you no more to live in these good hotels than in other houses of the first class.

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450 Rooms 450 Baths

DETROIT
1000 Rooms 1000 Baths

CLEVELAND
1000 Rooms 1000 Baths

ST. LOUIS
650 Rooms 650 Baths

There will be another Hotel Statler, in Boston. It will have 1100 rooms and 1100 baths; opening date to be announced later.



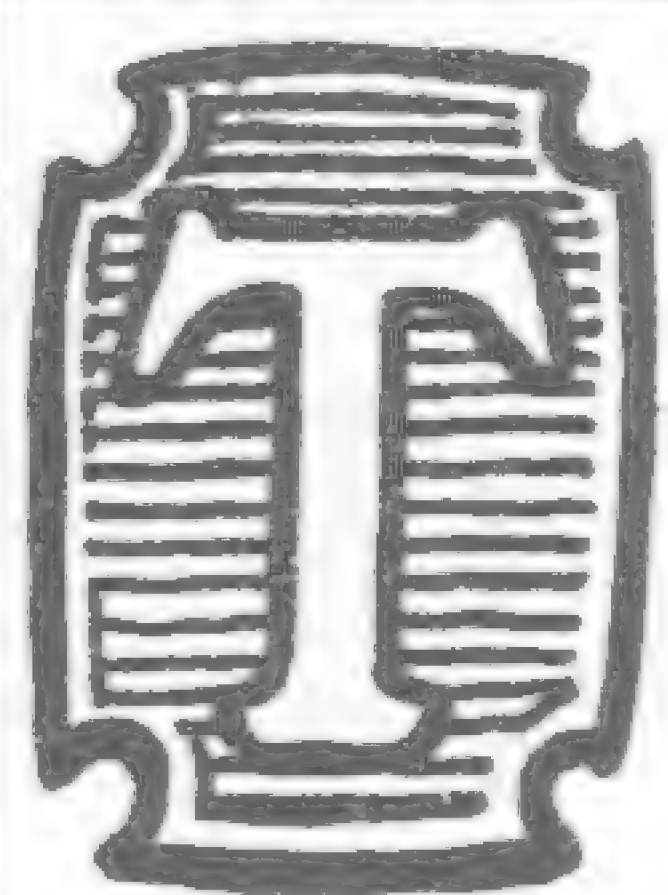
This small picture of Hotel Pennsylvania will give you some idea of its size.

In each of these hotels you will find unusual equipment (every room has a private bath, for one thing) and service; you will find people ready and anxious to help you; you will be centrally located, and surrounded by conveniences which will help to make your visit pleasant and comfortable.

Hotel Pennsylvania

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Opp. Pennsylvania Terminal—The Largest Hotel in the World—2200 Rooms, 2200 Baths



here is a vast difference!

The "difference" in the
"CAPSTAN" as compared to
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They are
"different"
in flavour
and in qua-
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"difference"
that pleases.

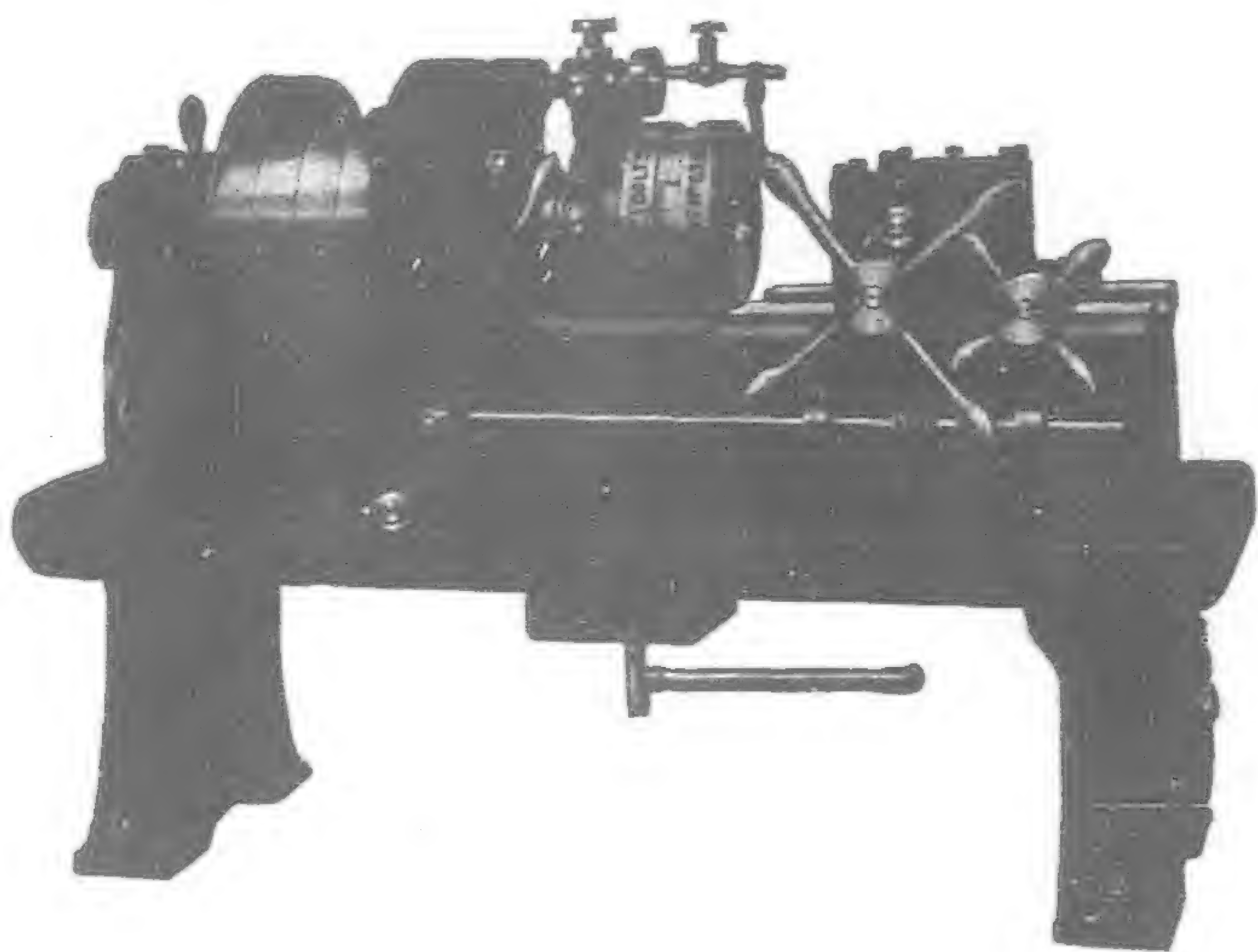


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CIGARETTE

"CAPSTAN"

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Heap's Patent Screwing Machines



are made in all sizes, and suitable for dealing with all classes of work.

The illustration opposite shows our 2in. Patent Automatic Bolt Screwing Machine which is one of a complete line of Single and Multiple Head Machines specially designed for use wherever large quantities of Bolts have to be dealt with in the most expeditious and economical manner.

We will gladly advise you as to the most suitable machine for your particular class of work.

Catalogue free on request.

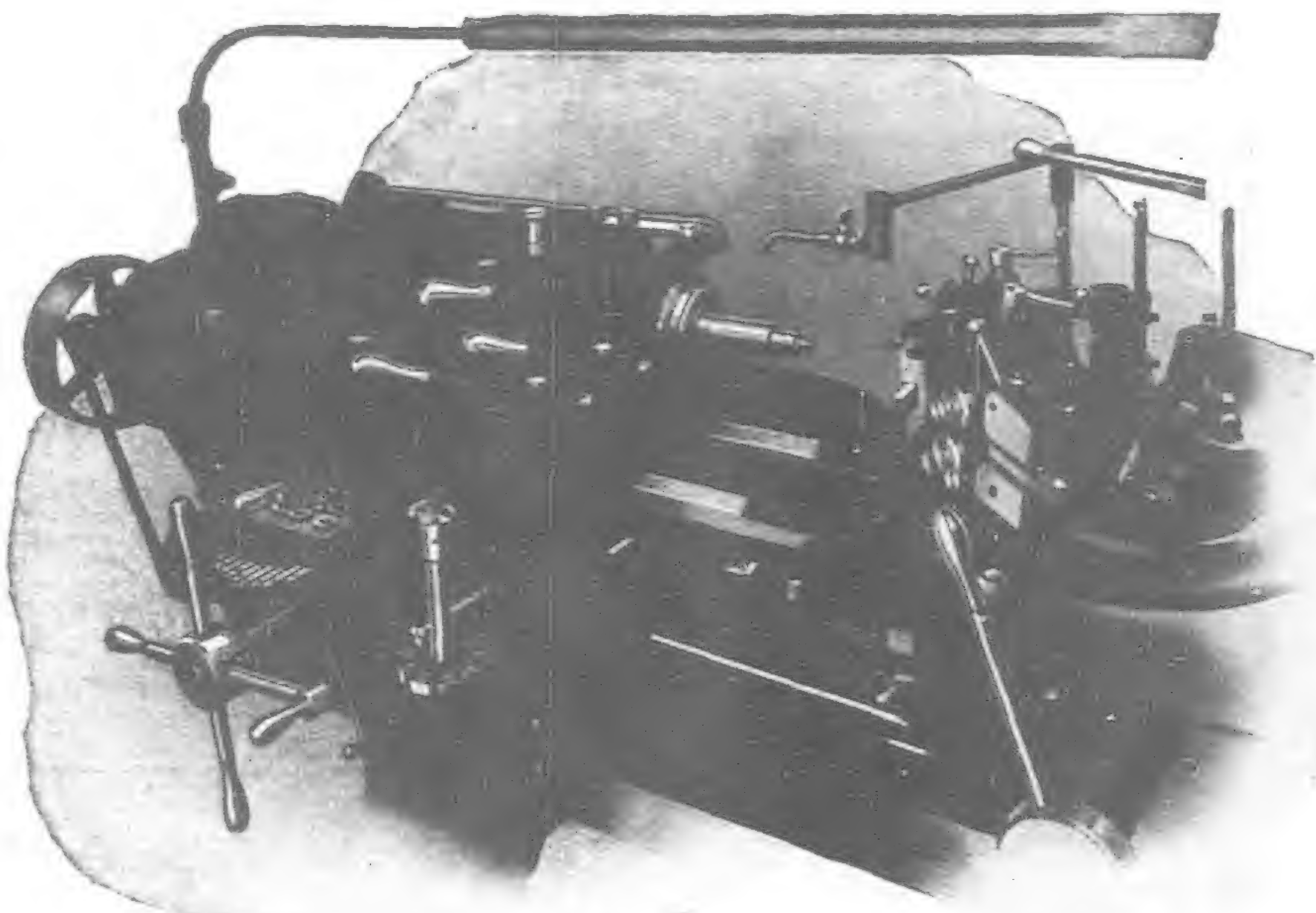
JOSHUA HEAP & CO., LTD.,

ASHTON-UNDER-LYNE, ENGLAND.

THE TOOLS AND THE WORK

Output depends on rigidity. Accuracy depends on rigidity. The essential point of rigidity in a tool is the rigidity with which the cutting edge of the tool and the work are held with relation to each other. Rigidity in other particulars is non-essential.

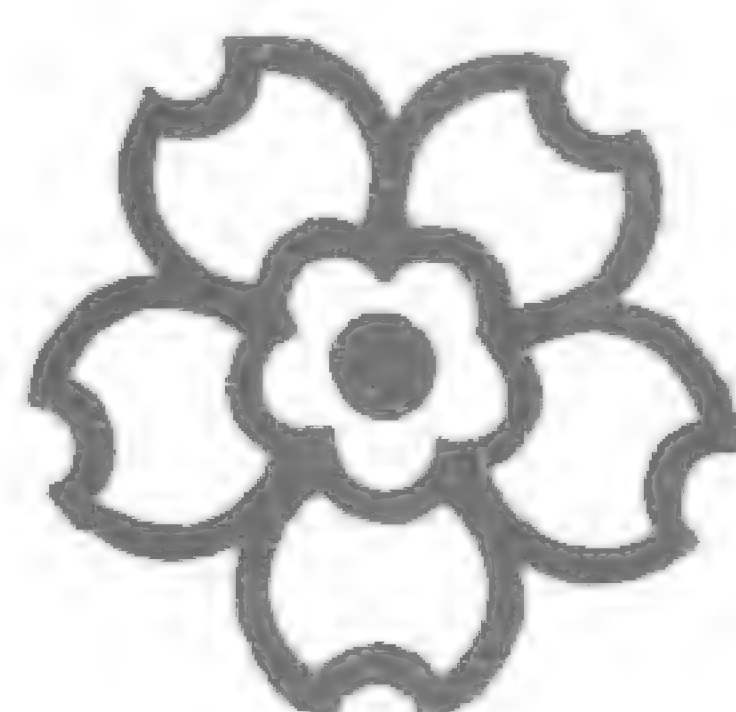
The Flat Turret Lathe is designed with an eye single to being rigid at the right points. The flat turret, with its slide gibbed directly to the bed, the cross sliding head with a broad spreading bearing on the bed, the self-contained design of the tool holders, the arrangement of the stops, and every other feature of the machine, work toward this one end. And this end is reached to its degree not attained by any other machine.



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Cable Address: "Turretium" London

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Capital Paid-up - - - Yen 50,000,000

Governor : S. Minobe, Esq.

Deputy-Governor : T. Kano, Esq.

Directors :

S. Ohta, Esq.

S. Katayama, Esq.

S. Yoshida, Esq.

S. Kakei, Esq.

Head Office : SEOUL (Chosen)

FOREIGN DEPARTMENT : TOKYO

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

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Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Hoilyong, Chongjin

Manchuria—Antung, Fengtien (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling,

Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingsun

China Proper—Shanghai, Tientsin, Tsingtao, Tsinan

Siberia—Vladivostock, Alexandrofsky Post

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LONDON REPRESENTATIVE :

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International Banking Corporation

CAPITAL U.S. \$5,000,000

SURPLUS AND UNDIVIDED PROFITS 10,458,137

OWNED BY THE NATIONAL CITY BANK OF NEW YORK

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SAN FRANCISCO OFFICE: 232 MONTGOMERY STREET

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TIENTSIN
HANKOW
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KOBE

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PANAMA

PANAMA
COLON

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MANILA
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SPAIN

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SINGAPORE

We are also able to offer our Customers the services of the Branches of the National City Bank of New York in the principal countries of South America, Central America and in the West Indies.

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H. C. GULLAND, *Manager.*

1A KIUKIANG ROAD.

BANQUE DE L'INDO-CHINE.

Capital	Frs. 72,000,000
Reserves	„ 70,000,000

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Canton	Hanoi	Papeete	Saigon	Tourane
Djibouti	Hongkong	Peking	Shanghai	

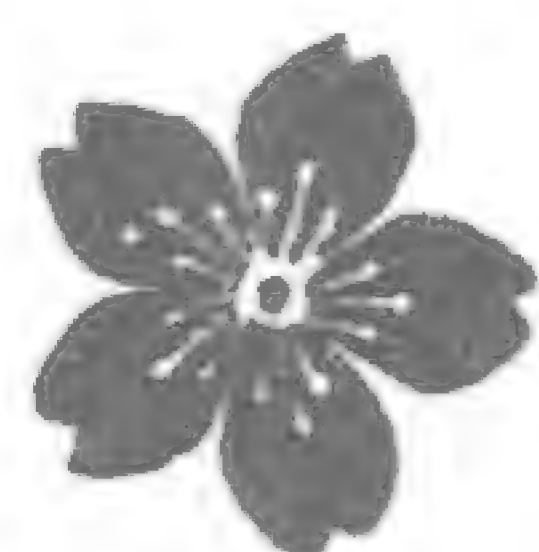
Bankers:

IN FRANCE: Comptoir National d'Escompte de Paris, Credit Lyonnais; Banque de Paris et des Pays-Bas; Crédit Industriel et Commercial Société Générale.

IN LONDON: The National Provincial and Union Bank of England, Ltd.; Comptoir National d'Escompte de Paris; Crédit Lyonnais.

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L. ARDAIN, *Manager*.



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TOKYO, JAPAN

Telegrams: "Jugo Tokio"

Capital Subscribed Y. 100,000,000 Capital Paid-up Y. 49,750,000 Reserve Funds Y. 23,900,000

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Managing Directors: Yutsuha Sato, Esq. and Kanesato Aiko, Esq.

Head Office Manager: Sei Usagawa, Esq.

Head Office: No. 6, 7chome, Kobiki-cho, Kyobashiku, Tokyo.

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Galvanized Wire
Bright Hard Wire
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Galvanized Barbed Wire
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THE BANK OF TAIWAN, LTD.

Established 1899

TAIPEH, FORMOSA, TAIWAN

Tokio Branch: No. 1 Eirakucho, 2 Chome,
Kojimachi

Telegraphic Address: TAIWANGINK

Telephones: 1060, 1066, 446, 449 Marunouchi

Capital Subscribed	.. ..	Y. 60,000,000
Capital Paid-up	.. ..	Y. 52,500,000
Reserve Funds	.. ..	Y. 11,780,000

President :

Kojuro Nakagawa, Esq.

Directors :

Gunji Kawasaki, Esq.
Kumematsu Morinaga, Esq.
Masumi Esaki, Esq.
Tadasu Hisamune, Esq.
Denkichi Takita, Esq.

Branches :

Japan :	Tokyo, Kobe, Moji, Osaka, Yokohama.
Taiwan :	Keelung, Tainan, Takow, and 11 others.
China :	Amoy, Canton, Foochow, Hankow, Kiukiang, Shanghai, Swatow.
London :	25 Old Broad Street.
New York :	165 Broadway, Benenson Investing Bldg.
Others :	Bangkok, Batavia, Bombay, Hongkong, Semarang, Singapore, Soerabaia.

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In the Principal cities and towns throughout the World. Interest allowed on fixed Deposits and Current Accounts on terms which may be ascertained on application. Most favorable terms are granted to Petty Current Accounts. Every description of Exchange and General Banking business transacted.

Special facilities are available for exchange business on China, Strait Settlements, East Indies, Australia, Great Britain, America, Canada and South Africa, etc.

K. NAKAGAWA, President.



Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED Yen 50,000,000

HEAD OFFICE:

MARUNOUCHI, TOKYO. CABLES "KOGIN," TOKYO

BRANCHES:

TOKYO: NIHONBASHI
 OSAKA: KORAIBASHI
 KOBE: NAKAMACHI

H. HIJIKATA, Esq., President

Y. ONO, Esq., Vice-President

K. IYANAGA, Esq., Director

T. IWASA, Esq., Director

KOZO MATSUMOTO, Esq.

AUDITORS:

NAGATANE SOMA, Esq.

KINTARO HATTORI, Esq.

TAICHI OHBA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

BUSINESS TRANSACTED:

- 1.—Loans on the security of public bonds of debentures and shares, estates (Zaidan), specified land and buildings.
- 2.—Subscription and underwriting public bonds or debentures.
- 3.—Deposits and safe custody of valuables.

- 4.—Trust company business.
- 5.—Discounting of bills.
- 6.—Foreign exchange business.
- 7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

BANK OF COMMUNICATIONS

*(Specially authorised by Presidential Mandates of April 7th, 1914 and October 31st, 1915
making the Bank of Communications a National Bank).*

Head Office: Peking

CAPITAL . . . Kuping Tls. 10,000,000

President: TSAO JOU LIN

Vice-President: JEN FUNG PAO

Every description of Banking and Exchange business transacted.

Interest allowed on Current Accounts and Fixed Deposits according to arrangement.

Credits granted on approved Securities.

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SHANTUNG PROVINCE.—Tsinanfu, Tsininchow, Chefoo, Techow, Tsaochwang, Lungkow.

HONAN PROVINCE.—Kaifeng, Lohyang, Chengchow, Chiaotso, Chowchiakow, Taokow, Leiho, Hsinhsiang, Changtefu, Hsinyangchow.

SHANSI PROVINCE.—Shihchiachwang, Tatungfu, Fengcheng, Yangkao.

KIANGSU PROVINCE.—Shanghai, Soochow, Wusieh, Chinkiang, Yangchow, Tsing-kiangpu, Pukow, Penpu, Hsuchow.

CHEKIANG PROVINCE.—Hangchow, Ningpo.

HUPEH PROVINCE.—Hankow, Shasi, Ichang.

KIANGSI PROVINCE.—Kiukiang.

HUNAN PROVINCE.—Changsha, Changteh, Yochow, Hengchow, Hsiangtan

SZECHUAN PROVINCE.—Chungking.

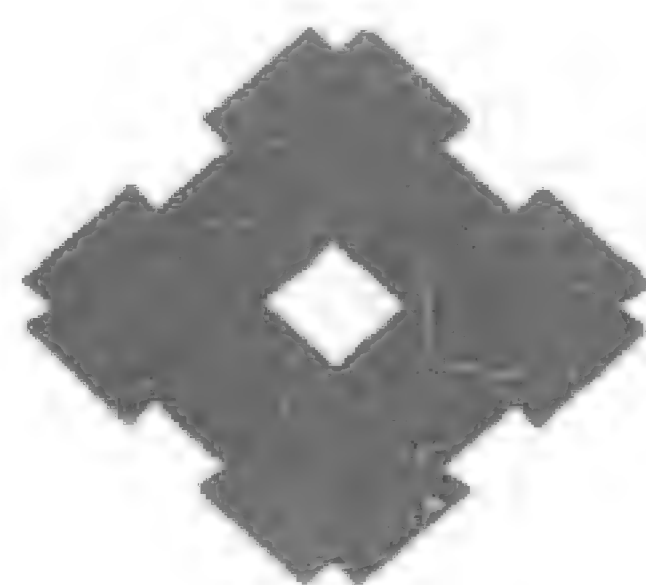
ANHWEI PROVINCE.—Wuhu, Anking, Hsuancheng, Panpu

KWANGTUNG PROVINCE.—Canton.

THREE EASTERN PROVINCES.—Yinkow, Fengtien, Changchun, Kirin, Tiehling, Sunchiatat, Liaoyang, Harbin, Chinsien.

SPECIAL DISTRICTS.—Jehol, Kueihuacheng, Lenghrien, Chihfeng, Hsinsi, Kalgan (Chahar).

ABROAD.—Hongkong, Singapore.



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Head Office: OSAKA, JAPAN

Cable Address: "SUMITBANK"

President: Baron K. SUMITOMO

Established March, 1912

(Successors to The SUMITOMO BANK)

Capital Subscribed Yen 70,000,000
Capital Paid-up „ 50,000,000

Reserve Fund Yen 23,100,000
Deposits „ 369,000,000

Head Office: Kitahama, Osaka

City Offices: Semba, Bingomachi, Nakanoshima, Dotonbori, Kawaguchi, Tenma, Nipponbashi.

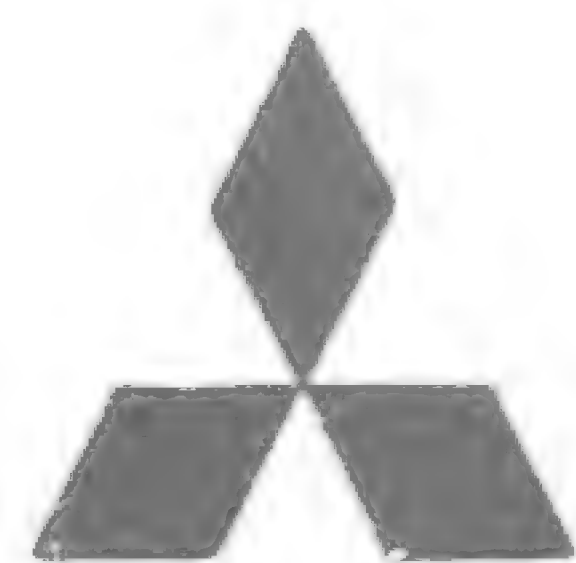
Home Branches: Tokyo (Tokyo, Toriaburacho, Fukagawa, Shinbashi, Asakusa), Marunouchi, Yokohama, Nagoya, Kyoto (Kyoto and Nishijin), Kobe (Kobe and Hyogo), Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Wakamatsu, Kokura, Hakata and Kurume.

Foreign Branches: Shanghai, Hankow, Bombay, London, New York and San Francisco.

Agents: The Sumitomo Bank of Hawaii, Ltd., Honolulu, Lloyds Bank, Ltd., London, National City Bank of New York, New York.

Correspondents: In all important places at home and abroad.

The Bank buys, sells and receive for collection Drafts and Telegraphic Transfers, issues Commercial and Travellers Letters of Credit available in all important parts of the world, besides doing general Banking business.



THE
MITSUBISHI
BANK,
 LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000

CAPITAL PAID-UP - - - Yen 30,000,000

CHAIRMAN:

Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Mikitaro Kikuchi Mr. Kiyoshi Sejimo
 Mr. Takeo Kato

HEAD OFFICE:

No. 3 Yayasucho Nichome, Kojimachi-ku,
 Tokyo, Japan.

BRANCH OFFICES:

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 Nihombashi (Tokyo), Osaka, Nakanoshima
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 York and London.

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Agents for the Hongkong and Shanghai Banking
 Corporation



THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673



Capital Subscribed...Y. 100,000,000.00
 Capital Paid-Up.....Y. 60,000,000.00
 Reserve Fund (July 1921).....Y. 28,000,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku,
 TOKYO

BOARD OF DIRECTORS:

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TOMITARO HARA, Esq., KANETARO KISHIMOTO,
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 NAGOYA, KYOTO, OSAKA, NISHI (Osaka),
 KAWAGUCHI (Osaka), NAKANOSHIMA
 (Osaka), KOBE, HIROSHIMA, SHIMONOSEKI,
 MOJI, WAKAMATSU, FUKUOKA, NAGASAKI,
 SHANGHAI.

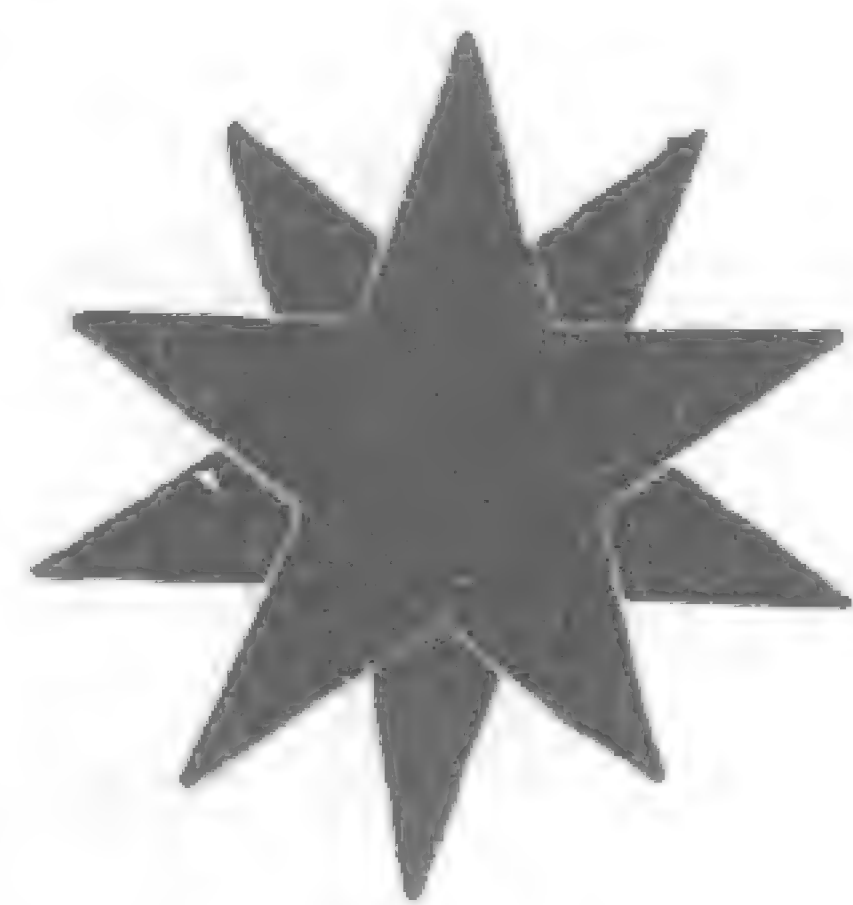
Foreign Agents:

London: Barclays Bank, Ltd.
 London Joint City & Midland Bank, Ltd.

New York: The National City Bank of New York.
 The Chase National Bank.
 Bankers Trust Co.

Paris: Banque de l'Union Parisienne.
 Comptoir National d'Escompte de Paris.

Bombay: National Bank of India, Ltd.



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(FORMERLY THE FIRST NATIONAL BANK)

ESTABLISHED 1873

Subscribed Capital	-	-	-	Yen 50,000,000.00
Paid-Up Capital	-	-	-	Yen 36,350,000.00
Reserve Fund	-	-	-	Yen 33,500,000.00

K. ISHII, *Managing Director.*

Y. SASAKI, *President*
Y. NOGUCHI, *Managing Director.*

S. SUGITA, *Managing Director.*

HEAD OFFICE :

No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.

T. AKASHI, *Manager*

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ISECHO, SHIN-OSAKACHO, FUKAGAWA, MARUNOUCHI.

HOME BRANCHES:

YOKOHAMA, NAGOYA, YOKKAICHI, KYOTO, NISHIJIN (KYOTO), GOJO (KYOTO), FUSHIMI, OSAKA, NISHIKU (OSAKA), MINAMIKU (OSAKA), HONMACHI (OSAKA), KOBE, HYOGO, HIROSHIMA, SHIMONOSEKI, CHOFU, MOJI, FUKUOKA, KURUME, KUMAMOTO, HAKODATE, OTARU, SAPPORO, MURORAN.

BRANCHES IN COREA:

SEOUL, FUSAN.

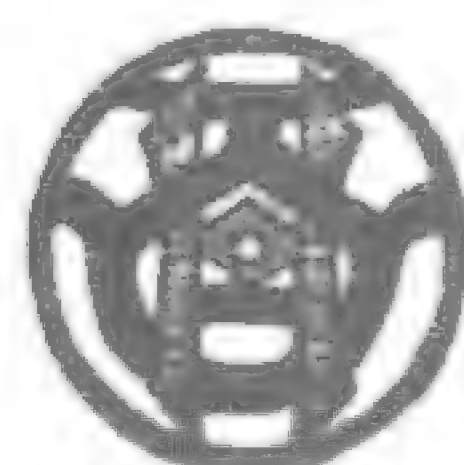
LONDON & NEW YORK BANKERS:

London { London County Westminster & Parr's Bank, Ltd.
The London Joint City & Midland Bank, Ltd.
The Yokohama Specie Bank, Ltd.

New York { The National City Bank of New York.
The National Bank of Commerce in New York.
The Yokohama Specie Bank, Ltd.

CORRESPONDENTS:

The Bank, in addition to its own Branches, has numerous Agencies or Correspondents in the principal Cities and Towns at Home and Abroad.



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(DAI HYAKU GINKO)

HEAD OFFICE, AWOMONO-CHO, TOKYO

TOKYO BRANCHES: No. 1 Torihatagocho, Nihonbashi: No. 10, Ginza Nichome, Kyobashi
YOKOHAMA BRANCH: Nos. 53-55 Honcho Shichome
OSAKA BRANCH: 28 Bingo-machi, Nichome
KYOTO BRANCH: Shijo Higashinotoin
SHINMACHI BRANCH: Shinmachi Dori Sanchome

President: K. IKEDA, Esq.

Managing Director: S. CHOH, Esq.

SUBSCRIBED CAPITAL	-	-	-	Yen 25,000,000
CAPITAL PAID-UP	-	-	-	Yen 17,500,000
RESERVE FUND	-	-	-	Yen 8,094,340
DEPOSITS	-	-	-	Yen 110,740,264

Transacts General Banking and Foreign Exchange Business. Conducts Trust Company Business

Hongkong and Shanghai Banking Corporation

Paid-up Capital	...	...	...	...	...	\$20,000,000
Reserve Funds: Sterling	...	...	...	...	...	£4,500,000
Silver	...	...	...	...	...	\$23,500,000
Reserve Liability of Proprietors	...	...	...	...	...	\$20,000,000

Court of Directors:

Hon. Mr. A. O. LANG,
Chairman

D. G. M. BERNARD, Esq.,
Deputy Chairman

A. M. BOWES-SMITH, Esq.

G. M. DODWELL, Esq.

G. T. M. EDKINS, Esq.

P. H. HOLYOAK, Esq.

Hon. Mr. E. V. D. PARR

W. L. PATTENDEN, Esq.

H. P. WHITE, Esq.

Head Office: HONGKONG

Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

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Shanghai Branch: 12 The Bund

Sub-Agency: 9 Broadway

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COLOMBO	PENANG
DAIREN	RANGOON
FOOCHOW	SAIGON
HAIPHONG	S. FRANCISCO
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HARBIN	SOURABAYA
ILOILO	SUNGEI PATANI
IPOH	TIENTSIN
JOHORE	TSINGTAO
KOBE	VLADIVOSTOCK
KUALA LUMPUR	YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted. Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America.

G. H. STITT, Manager.

BRADLEY & Co., Ltd.

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CHATER ROAD

HONGKONG

MACHINERY DEPARTMENT

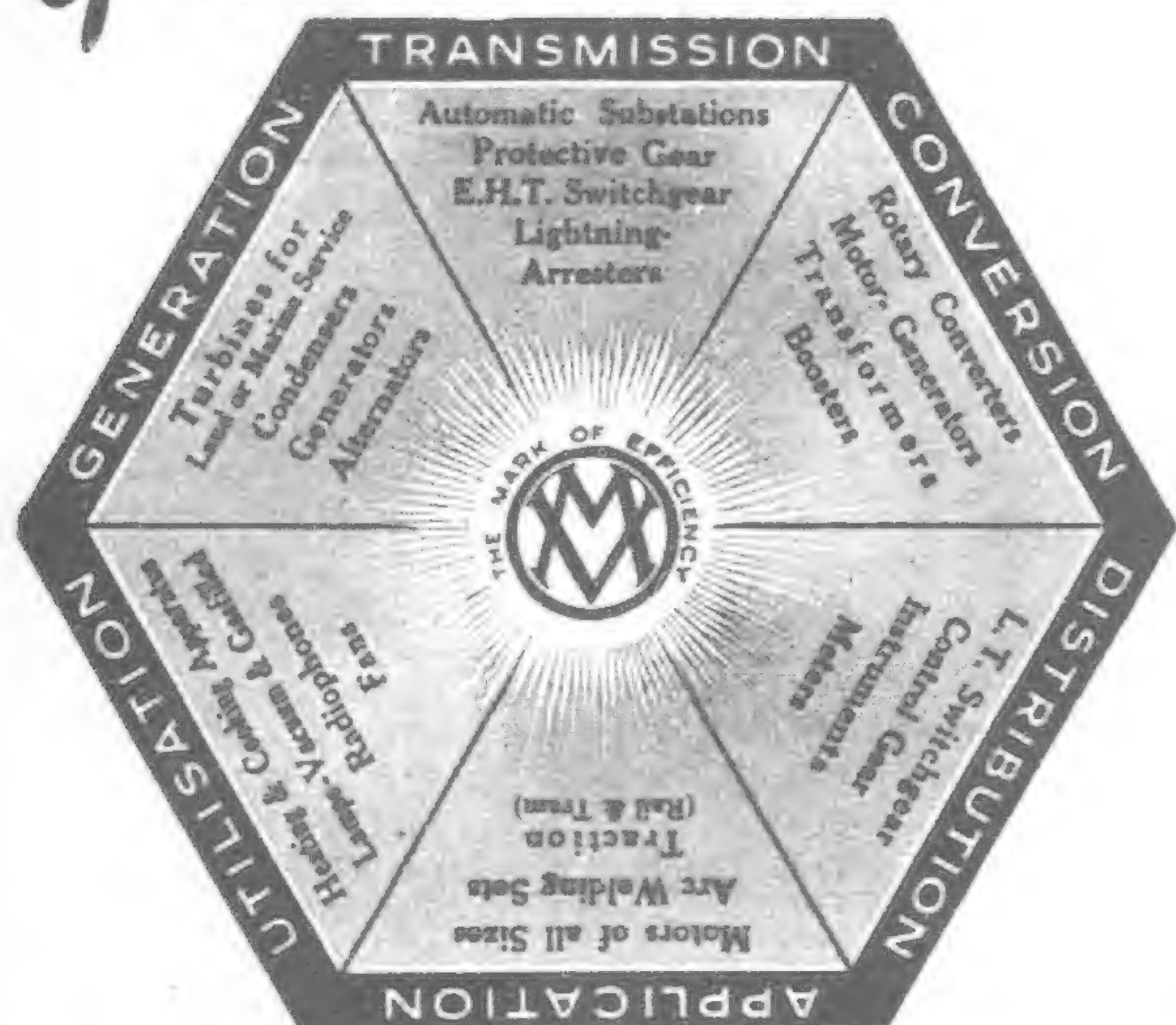
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The cabinets are "Kellogg built" and will retain their handsome appearance after many years of service. They are of unusually durable construction, reinforced with metal where necessary.

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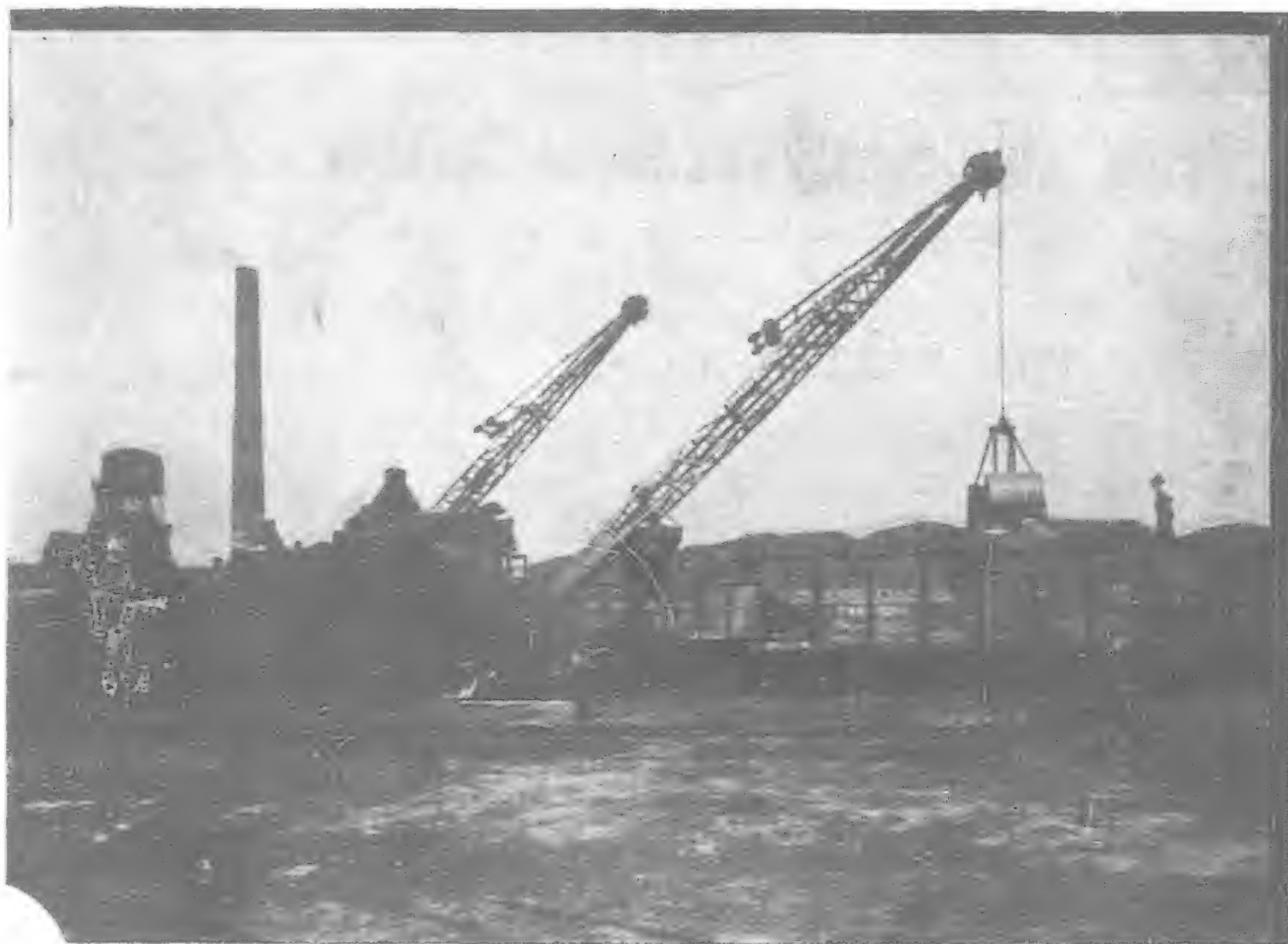
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BROWNING

LOCOMOTIVE CRANES



An Investment with a Dozen Profits—

A Browning owner usually buys a Browning for one purpose—and then finds himself profiting in a dozen other ways, some quite unexpected.

For example, many a Browning more than pays interest on its investment simply by its side-job as a private switch engine—all its major work counts as pure profit. Many a Browning bought simply to handle coal at the power plant finds itself in steady demand in other parts of the yard on wholly different tasks.

In considering a crane purchase, keep in mind these three distinctive points about a Browning—

(1) Designed for all around usefulness in bucket, grapple and magnet work, also steam shovel and pile driver attachments.

(2) Solidly constructed for long trouble-free performance on each job.

(3) Notable for economical performance.

It will pay you to buy the savings a Browning will earn for you.

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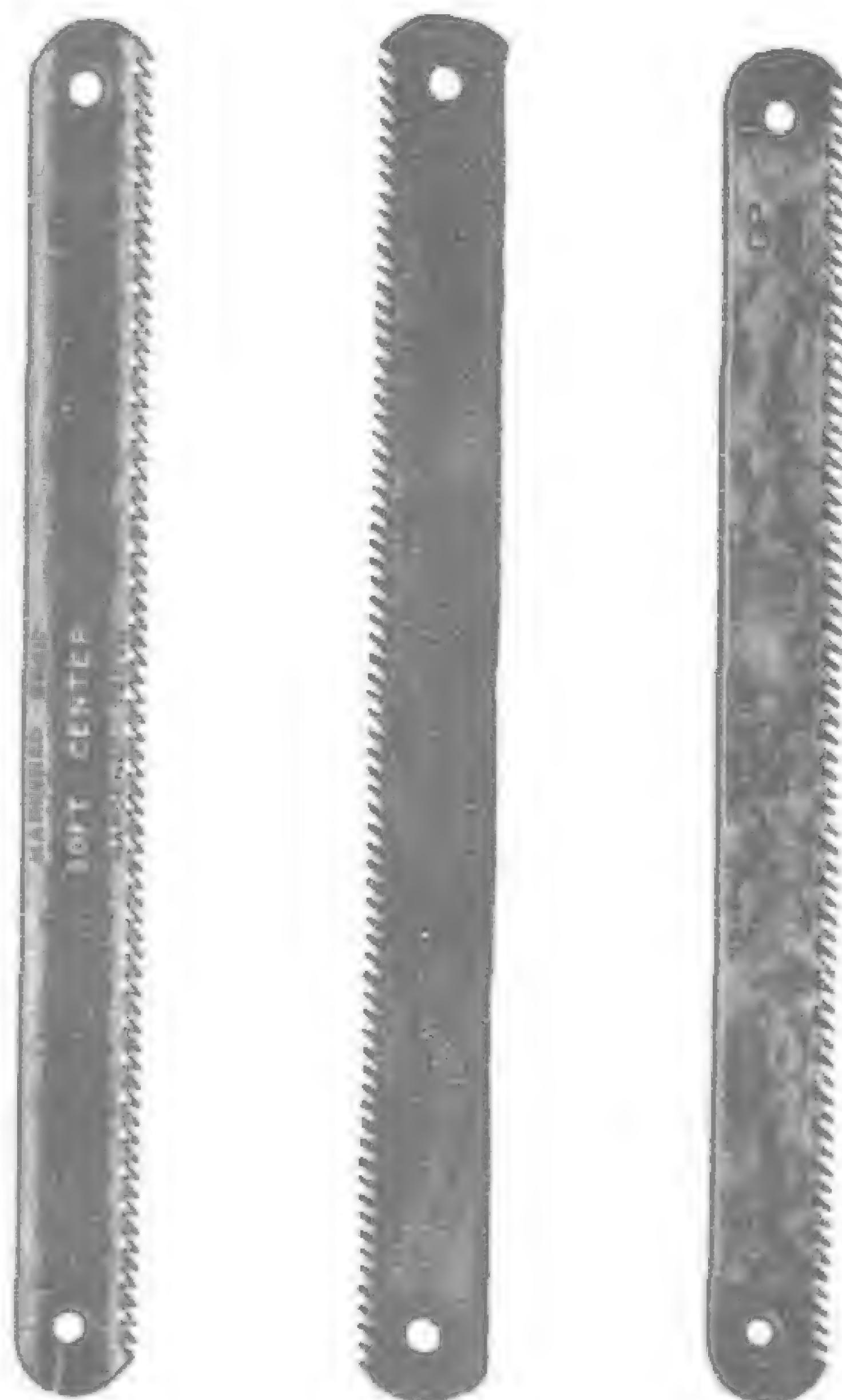
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Just as in every other one of the 1,500 Goodell-Pratt Tools, quality is the first consideration. Only the best materials, skilful workmanship and the most approved designing ever enter Goodell-Pratt Tools. Their supremacy is recognized the world over.

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COMPANY

Toolsmiths

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Branch Offices: TOKYO, SEOUL, HARBIN, KIRIN, PEKING, SHANGHAI AND NEW YORK.

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Quality Insures Service

Governments and Industrial Corporations about to place orders for motive power of any type should give the most careful study and attention to design and equipment. Baldwin Industrial Locomotives are known throughout the entire world by reason of correct design, especially suited to the requirements of service.

SIX-WHEELED SHUNTING ENGINE BUILT FOR HOKKAIDO, KOGYO TETSUDO, K.K. (JAPAN)

Gauge, 3 feet 6 inches; Cylinders, 13 inches × 20 inches; Working pressure, 170 pounds; Fuel, soft coal; Driving wheels, diameter, 40½ inches; Weight, 72,700 pounds.

In the shunting engine illustrated, a few of the characteristic Baldwin features are as follows:—

Accessibility of all parts for repair or replacement.

Convenience in cab for engineman and ample room for firing.

Low center of gravity. Can be safely operated over rough and uneven tracks and sharp curves.

Exceptionally well equalized. Can be operated with minimum injury to tracks.

Tires are of a specially hard material best adapted for maximum life to both tread and flange.

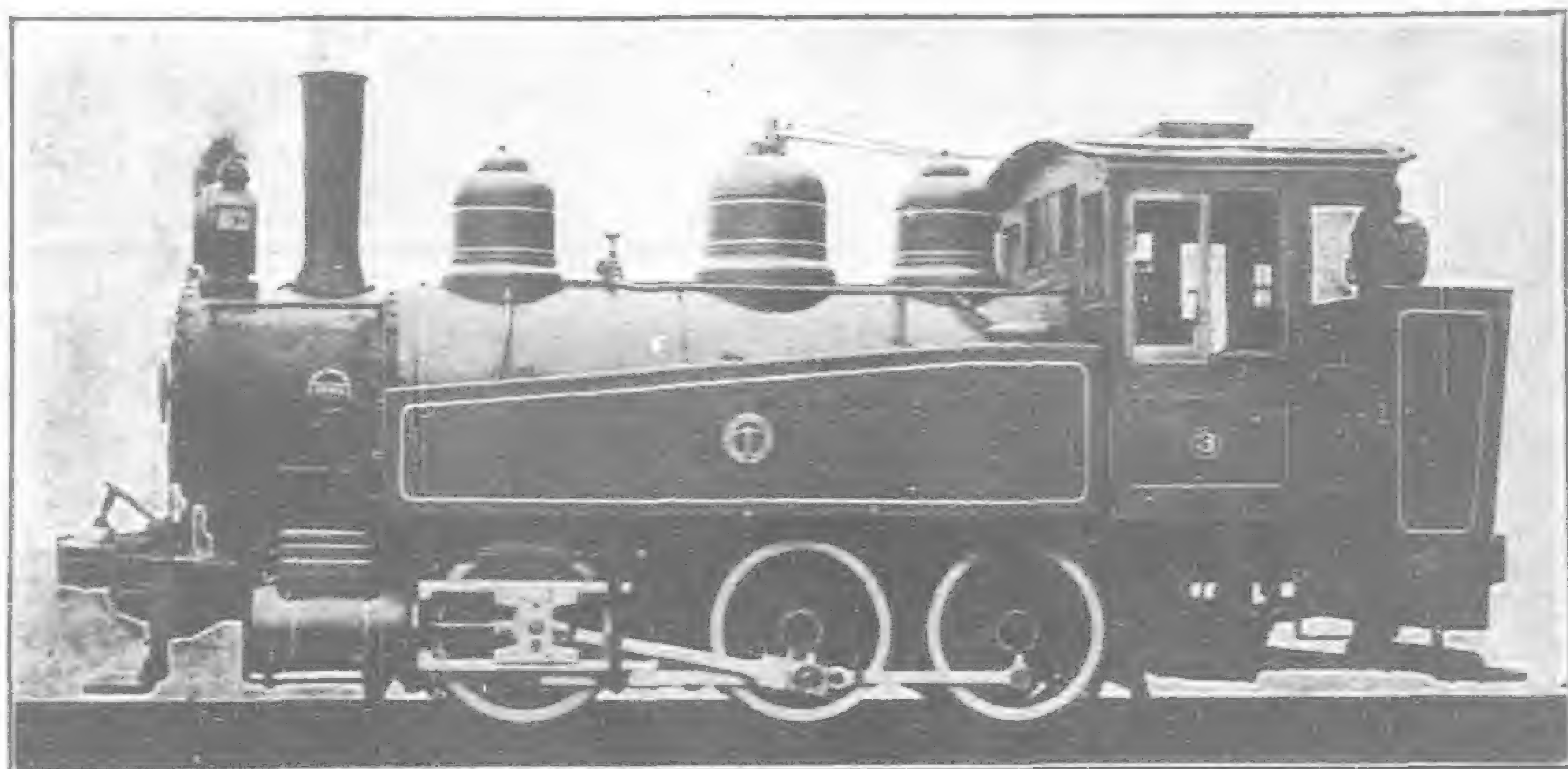
Springs conveniently placed on short saddles directly over the journal boxes and connected with equalizing levers in the same plane.

Bar frames are of extra heavy section. Their "open" character adapts them especially to the convenient placing of equalizing levers and machinery.

Unusually large journals for driving axles and crank pins, insuring maximum life with minimum wear.

A balanced throttle with a latched lever. This type is more positive and convenient than the slide throttle and rotating crank.

Side tanks are sloped forward to give the driver a clear view ahead when coupling or manœuvring.



SIX-WHEELED SHUNTING ENGINE BUILT FOR HOKKAIDO, KOGYO
TETSUDO, K.K. (JAPAN)

Both hand and steam brakes are provided. The Baldwin steam brake is the most efficient yet devised.

Lubrication is by condensing sight feed lubricator in the cab, giving positive and economic operation. This system will be found superior to lubrication by mechanical means. All oil cups on wearing parts are easy of access.

Rocking bar type grates are easy to operate and economical of fuel.

A most important feature of Baldwin construction which will appeal to purchasers of motive power is that all materials used are in accordance with the specifications of the American Society for Testing Materials, an association of international repute. This insures highest quality. Our nearest representative is at your command at any time.

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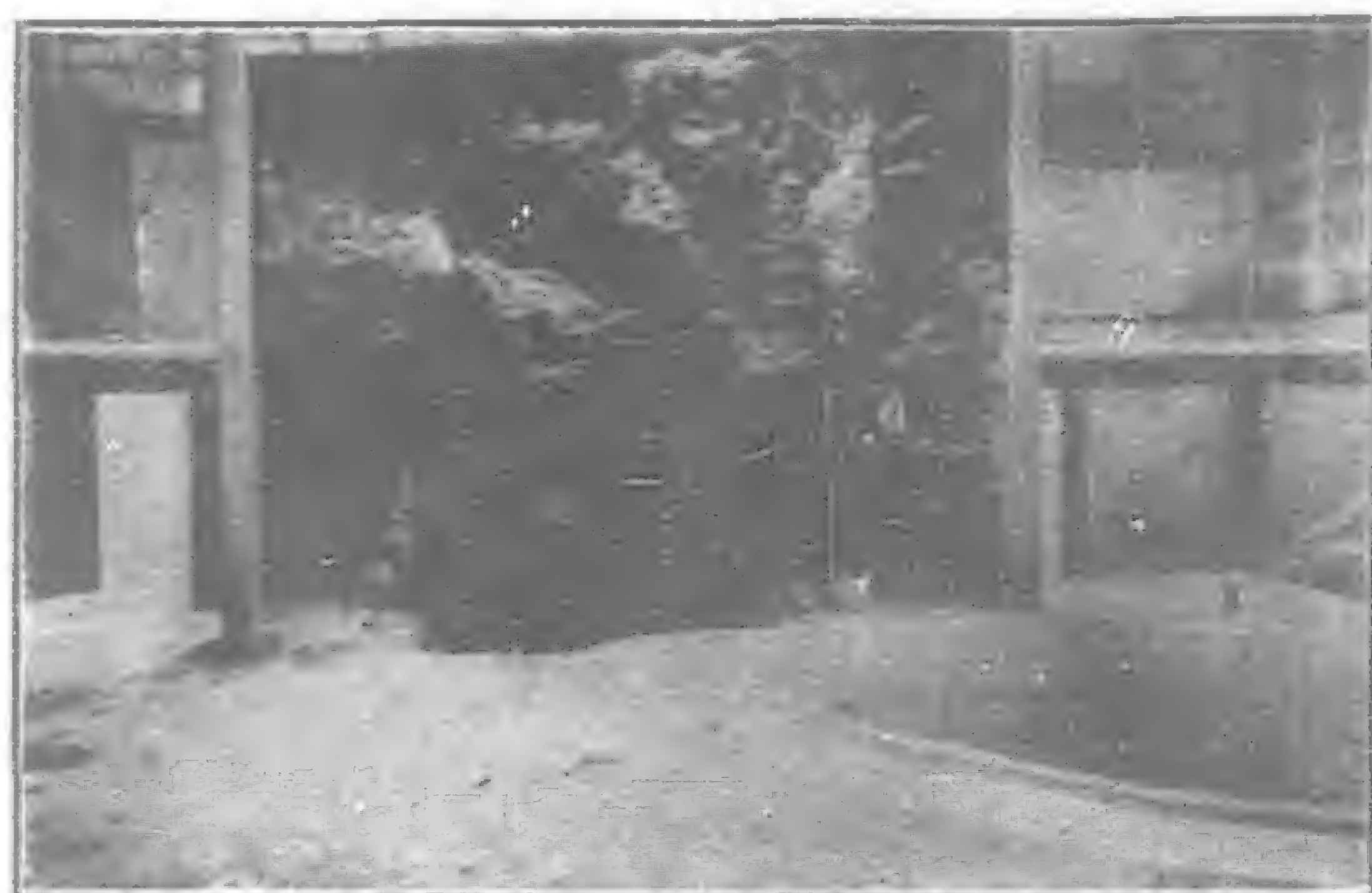
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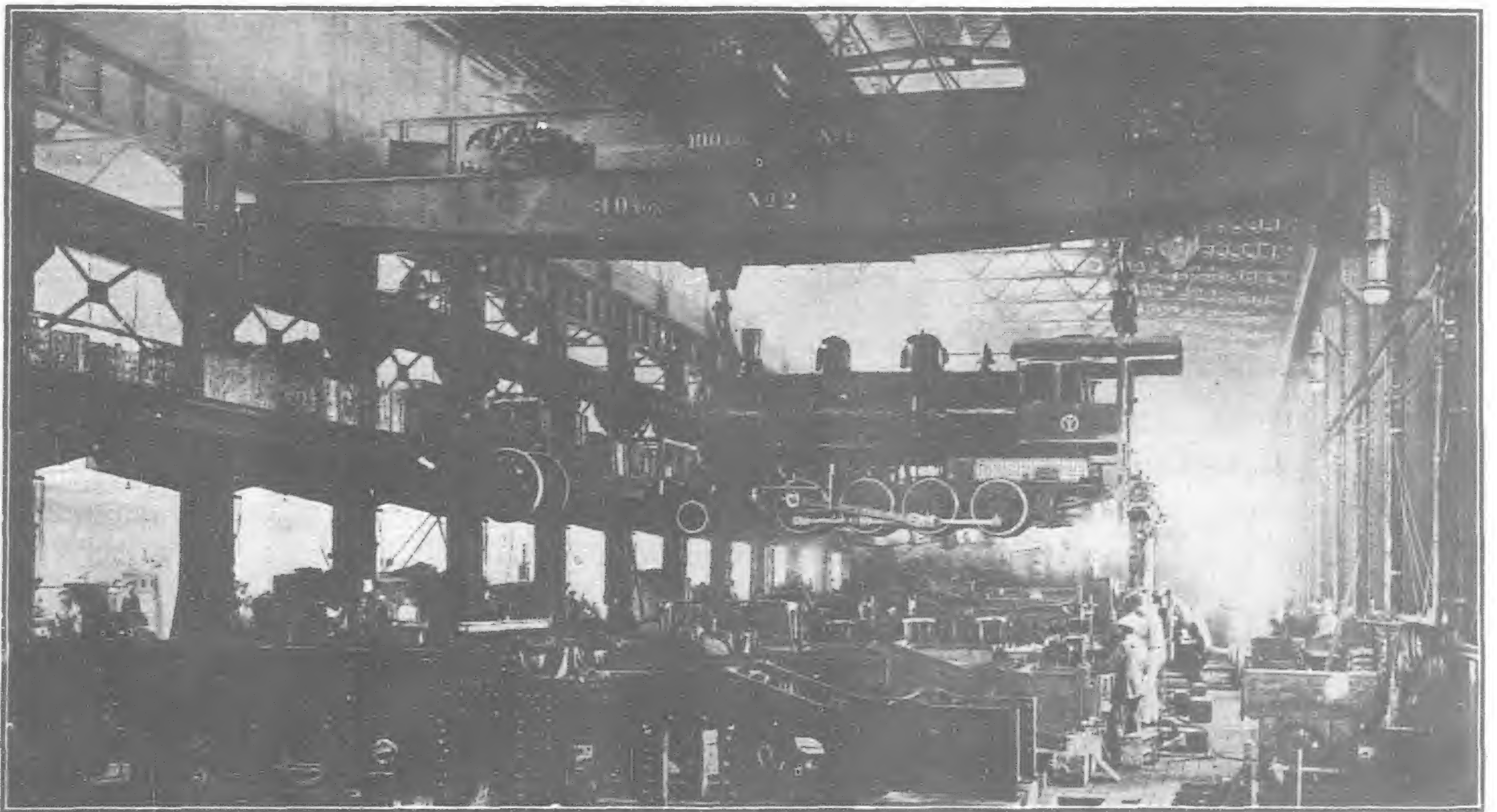
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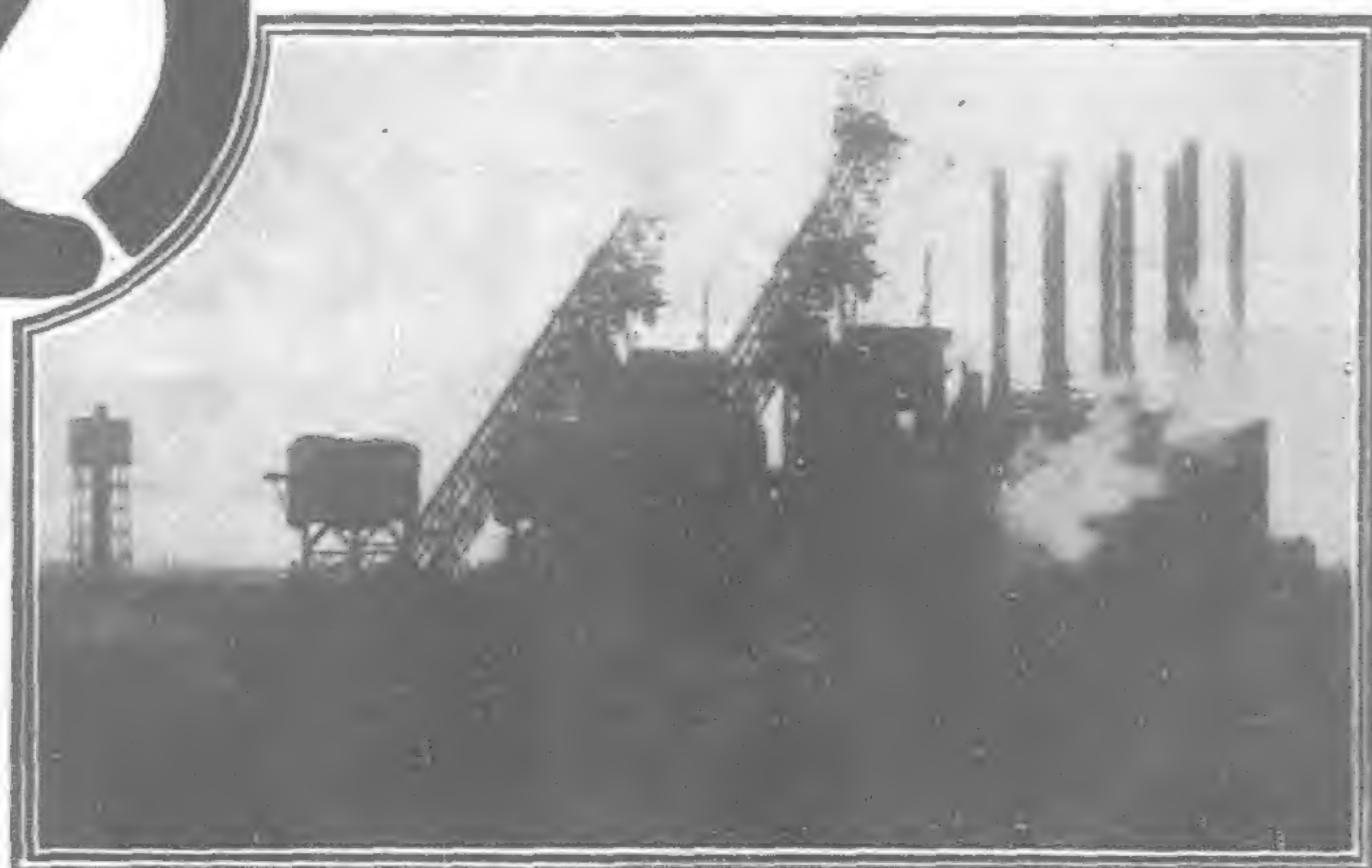
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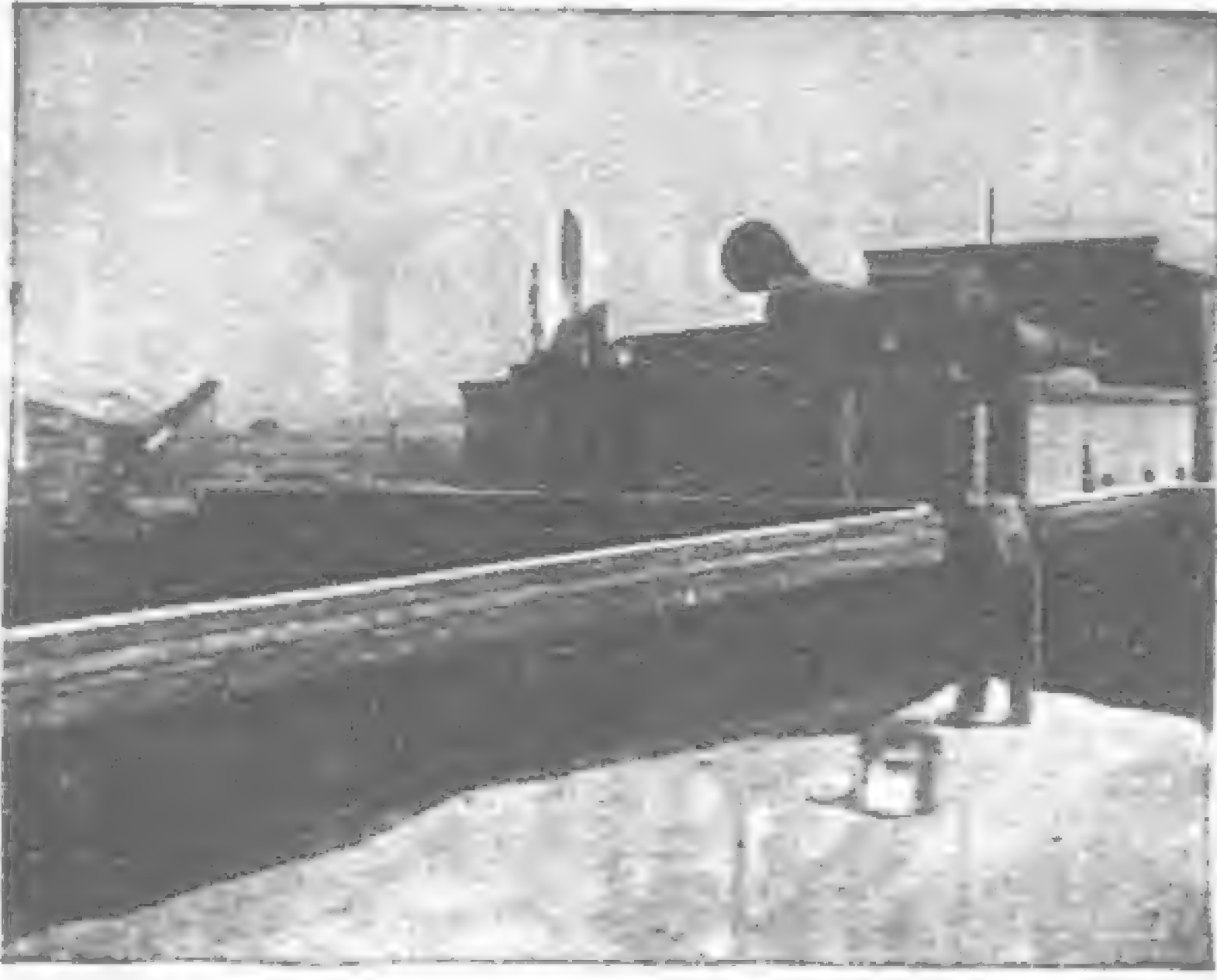
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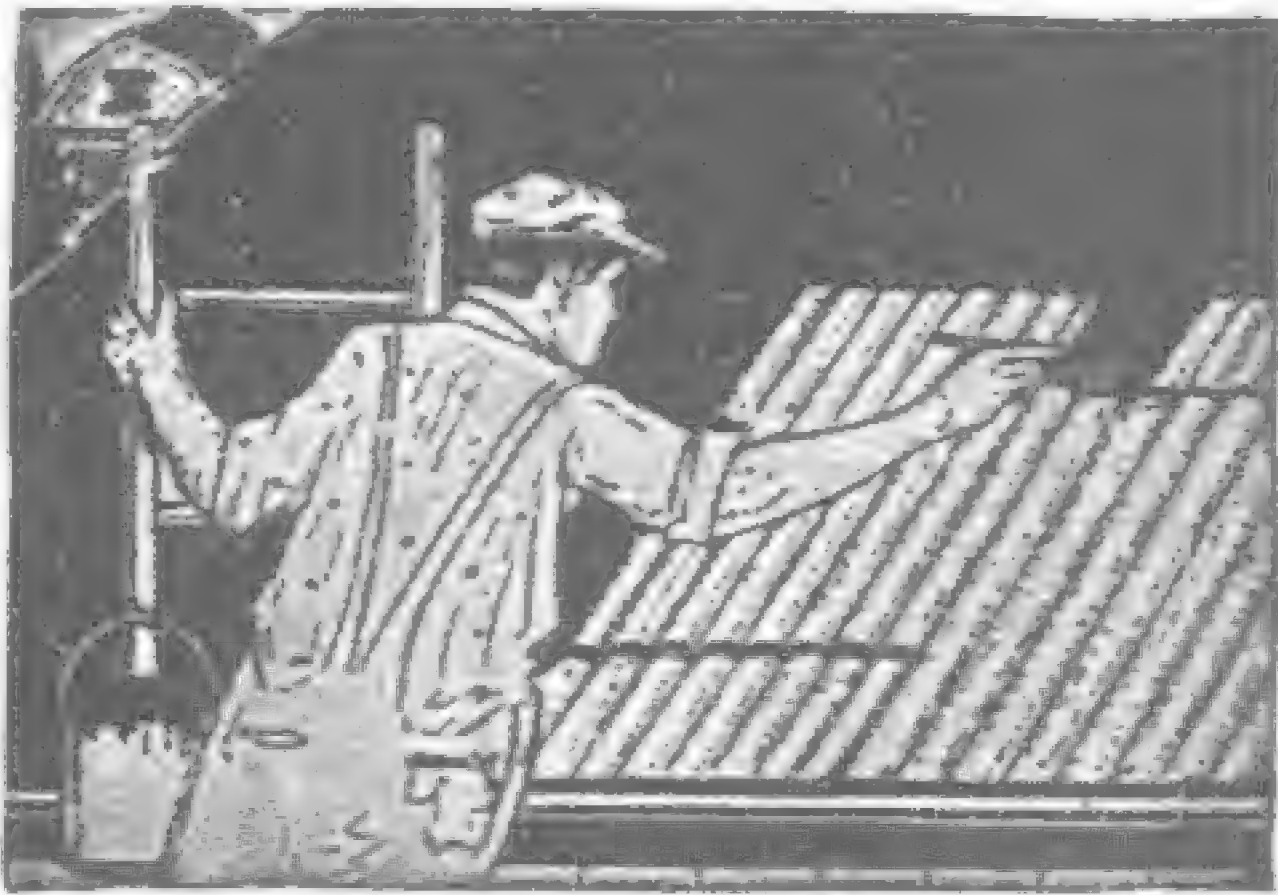
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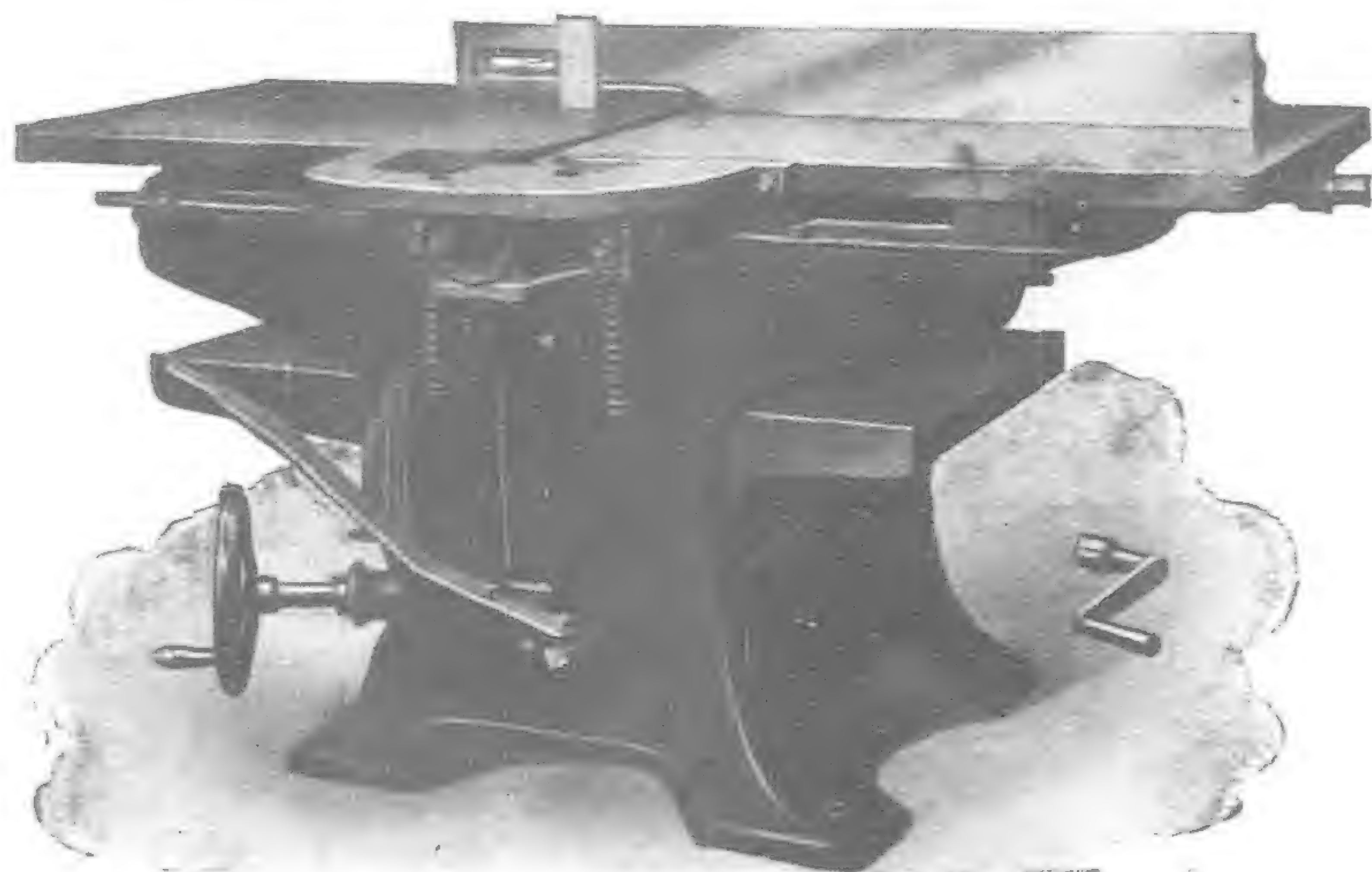
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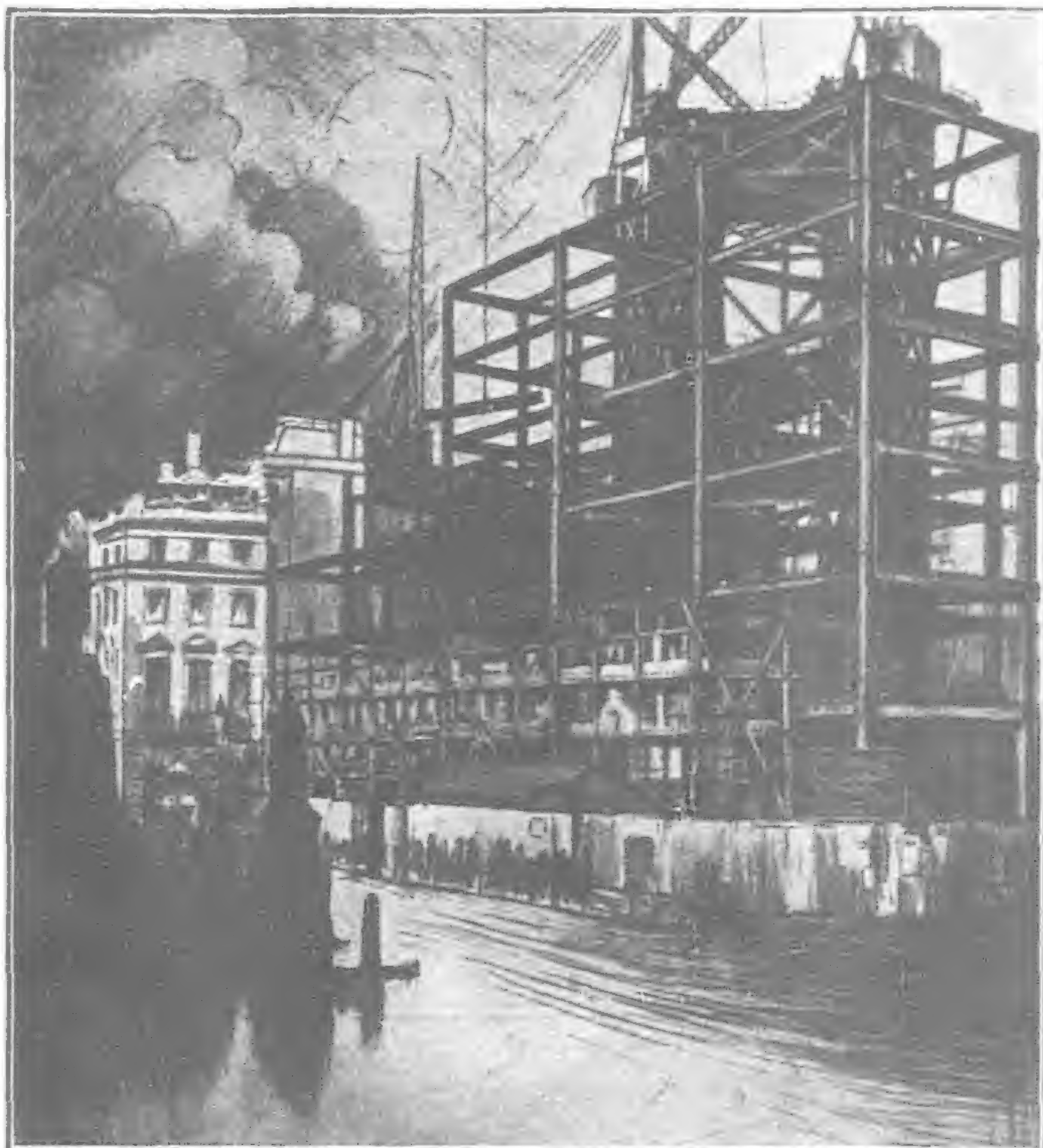
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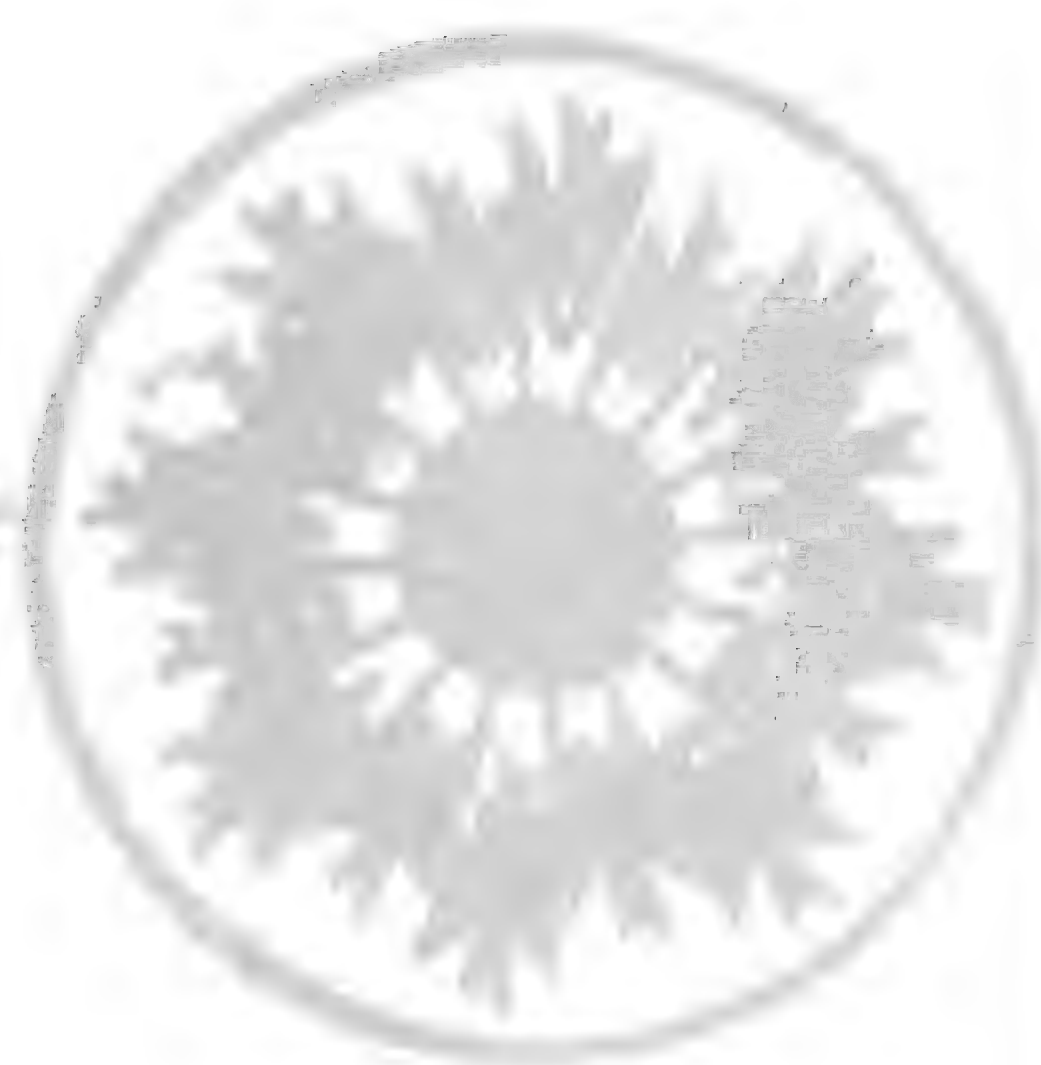
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The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

VOL. XIX

SHANGHAI, JANUARY, 1923

No. 1

Anglo-Japanese Pact Survives

IT begins to look as though the high advisory staff to the Peking government overlooked a bet in their campaign to destroy the Anglo-Japanese alliance. They failed to reckon with France, who, up to date has not ratified the four-power treaty. As a consequence, the Anglo-Japanese alliance was automatically renewed on November 23 for another year.

NOW THE FAR EASTERN REVIEW has never agreed with those who professed to see in this instrument a menace to the peace of America maintaining that its simple modification in 1911 eliminated any possibility of its binding Great Britain as an ally of Japan in the event of a war between that country and the United States. It may not be good policy to disagree with the majority opinion, but nevertheless we hold firmly to the conviction that American sentiment has been influenced by a calculated misrepresentation of the facts, in order to further the schemes of war-makers who hoped by isolating Japan to facilitate her downfall. With the alliance in full operation there was little hope of precipitating a situation in the Far East that would bring America into the conflict. With Japan discredited and world opinion turned against her by the most audacious campaign of falsehoods the world has ever witnessed, bereft of the material support of Great Britain, and held up to world contempt as morally impossible, the "show down" would have been forced on some pretext that would have saddled America with the task of "putting Japan in her place."

If France persists in her present attitude and declines to ratify the four-power pact, what then? The American senate rejected the Versailles treaty which guaranteed France against future attack; why should France now become a party to a pact designed to guarantee American insular possessions in the Pacific against attack? It may not be a wise move for France, as it can only result in bring-

ing America, Great Britain and Japan into closer harmony for the solution of Pacific and Far Eastern problems, and may in the end lead to the creation of a new balance of power in order to offset the present tendency of France to resume her traditional relations with Russia. The isolation of France under prevailing international political conditions will automatically compel the perpetuation of the Anglo-Japanese alliance as the one practical safeguard for their mutual interests in Asia, with a possible three-power pact for the preservation of peace in the Pacific. Once the Anglo-Japanese alliance is shorn of its menace to the United States, Americans have no reasonable right to challenge its usefulness.

The flirtation with Russia added to a growing French irritation against their former allies for failing to live up to the provisions of the Versailles treaty, may well result in overthrowing the league of nations and other pacts and force a return to alliances as the only safe way to preserve the balance of power. In this case, whether we like it or not, Americans will be compelled in self-defense to cast aside our traditional aloofness, and in the Pacific at least, resort to age old practices and line-up with powers whose interests are identical. This means, if it means anything at all, that the United States, Great Britain and Japan would form a *bloc* that would counterbalance any Russo-Germanic-Turco or Franco-Russo combination. If we swing back to pre-war days with France and Russia in full accord on Asiatic policies, and with Germany and Russia working in close harmony, the impotence of China to fulfill her most elementary international obligations, must of a necessity restore the Anglo-Japanese alliance to its full vigor. And, as we have repeatedly pointed out, as long as that instrument carries no menace to the United States, its operation is absolutely none of our concern. If we wish to make it our business, we must either share its obligations; or play the game with Russia and China.

The U.S.-Russo-Chinese Combination

THE interview with Mr. Roy C. Anderson printed in the *New York World* of November 7, in which he declared that the United States will have to go to war with Japan over China, once more indicates that most of the high advisers to the Chinese government are monomaniacs on this subject, furnishing further evidence, if such evidence be necessary, of the existence of a common understanding between these highly paid employees of Peking. Mr. Anderson is introduced to his American audience as "adviser to Chinese presidents, counsel to provincial governments and representative of great American corporations in China," harvesting the usufruct coming and going.

It was not our intention to refer to Mr. Anderson's activities after the rebuke administered by the *North-China Daily News* and the *Japan Advertiser*, but the last mail from America tells us

he is still working to poison the minds of Americans against Japan. He now alleges that the failure of France to ratify the four-power pact arises from a secret understanding entered into at Tokyo when Marshal Joffre passed through Japan last March.

"That mission" High Adviser Anderson assures the American public through the Hearst publications of December 7, "*undoubtedly dealt with the position of France in the Pacific and it was taken for granted in China, by foreigners and Chinese alike, that an understanding had been reached in Tokyo between the gallant marshal and the Japanese government. The proof would appear to be the lack of interest in Paris concerning the four-power pact.*"

If such a conclusion was reached by foreigners and Chinese alike, it only goes to illustrate how tortuous are the workings of the minds who advise the Chinese government; how little they are informed as to the larger phases of world politics. Marshal Joffre

also spent some time in Peking. Applying the logic of Mr. Anderson to present world tendencies, it might be taken for granted that Joffre also concocted some scheme with Wu Pei-fu or Chang Tso-lin to co-operate with Russia, and, indirectly, by reason of the present trend of French diplomacy, with France. Once we follow the devious workings of the Peking advisory mind, taking for granted that which appeals most to our ideas, there is no end to plausible conclusions.

To arrive, however, at any correct estimate, it would first be essential to ascertain just what position Mr. Roy C. Anderson actually holds in the Chinese *tuchun* oligarchy. Is he really the adviser to the president of China, to Wu Pei-fu, to Chang Tso-lin; the representative of great American corporations in China? What are the names of these great corporations? If true, what was Mr. Anderson doing in Mukden and then in Moscow hobnobbing with Soviet officials? When Mr. Anderson tells the people of the United States that China, Russia and America must stand together and that America must intervene in Manchuria to save China from Japan, there is a good sized nigger concealed in-the-wood-pile somewhere. It would be interesting, most interesting, in view of present intrigues in the north, to know the names of these great American corporations represented by the adviser to Chinese presidents and *tuchuns*. The story smells fishy, and looks as though Mr. Anderson is mixed up in some political intrigue which carried him to Moscow and from there to Washington. The same logic which enables Mr. Anderson to take for granted that Japan and France have entered into a secret understanding to destroy the four-power pact as a result of Joffre's visit to Tokyo last March is applicable to his own visits to Chang Tso-lin and Lenin, and by the same process of reasoning the proof of this would appear to be sufficient by his advocacy of a Sino-Russo-American understanding. It's a poor rule that don't work both ways.

If the good faith of Japan and France is to be openly impugned by a high Chinese official accusing them of double dealing, entering into treaties they have no intention of carrying out, the Chinese government should publicly repudiate his activities and utterances or accept the responsibility for spreading propaganda and misleading reports calculated to impair world peace. The fact that Japan has religiously lived up to all her commitments at Washington, that her foreign minister has declared if France fails to ratify the treaties, Japan will work in harmony with the United States and Great Britain for the solution of Far Eastern problems, means

nothing to the unsound reasoning powers of these mischief-makers.

If we employ Mr. Anderson's methods in arriving at deductions, we might take for granted that he is engaged in some intrigue as the outcome of his visit to Moscow, by his advocacy of a partnership between America, Russia and China to fight Japan, in which, of course, the poor fish that will do all the fighting and supply all the financing will be, as usual, America.

In conclusion, we will permit the *North-China Daily News* and the *Japan Advertiser* to express their opinion on his present activities. On learning through Reuter's of the substance of his interview in the *New York World*, our Shanghai contemporary expressed entire disagreement with and reprobation of the interview given out in the United States, characterizing his "attempt to revivify the ancient bogey of Japan's hostile designs against the United States as deplorable and unjustifiable. At such a time as this in Japan when the new ideals are steadily gaining ascendancy over the old, nothing could be more mischievous than to make trouble between China and Japan except to try to involve America in the quarrel."

The *Japan Advertiser*, after shooting his arguments full of holes and utterly discrediting the high adviser to Chinese presidents, ends by saying:

"Mr. Anderson's statements are the most glaring recent example of a wholly mistaken—or if not mistaken, utterly vicious—campaign of misinformation about the Far Eastern relations of Japan and the United States. China will have little reason to be thankful to him and his fellow 'advisers.'"

If Mr. Roy C. Anderson, is, in effect, what he advertises himself to be, it would seem by so openly impugning the good faith of Japan and France, he has placed the Chinese government in a most delicate position. The tragedy of Europe was precipitated by Austria's ultimatum to Servia, and one of Austria's principal grievances against her neighbor was the incessant propaganda carried on by the Serbs to undermine her prestige with other powers and instigate uprisings against her authority. We do not believe that Japan would follow the example of Austria by presenting a similar ultimatum to China, but she would be amply justified before the world in calling upon the Chinese government to repudiate the activities of its high advisers and demand their dismissal.

The American-Russo-Chinese coalition advocated by the high adviser to the Chinese government is, however, worthy of further investigation. Let us pass on.

Baiting the Trap for America

JUST before the Far Eastern republic threw off its mask and went back into the fold of the Soviet, it gave to the Sinclair Oil Company, an American organization, the exclusive right to bore for oil in the northern half of the island of Saghalien. Interviewed on November 20, on the significance of this concession, Mr. B. Svirsky, the English speaking chief of the Far Eastern republic's delegation in Washington, said that although the Japanese were then holding the territory as security for reparations growing out of the Nikolai-evsk massacre, "they would have to get out." "The United States has announced it will defend the rights of American citizens in all parts of the world," he added as justification for granting the concession in disputed territory. Fine! Great Stuff!

The International News Service sends out from its Peking bureau under date of November 18, the story that Mongolia's "Living Buddha" has gone into partnership with a firm of American engineers for the development of mineral resources. Concessions have been granted including approximately one-third of Mongolia and total 250,000 square miles of territory, the possibilities of which geologists declare most unlimited.

"Preliminary surveys show that stores of gold amounting to many millions of dollars lie within easy access. The area was originally ceded to Russians, who, in co-operation with Mongolian princes and the Chinese government, secured the concession. Various political intrigues and internal disturbances made mining difficult, and in 1900 the working groups were reorganized into the now famous 'Mongolyor' Company, the stock of which was sold in nearly every country in the world. One of the large subscribers was the late King Leopold of Belgium.

"Bolshevik successes in 1920 made further operations impossible. By a series of dramatic episodes the leases and concessions fell to two American engineers, Edwin W. Mills and J. F. Manning, who have now the control of the company, which they have reincorporated as an American concern. The future seems unusually bright since the Mongolian government has shown its willingness to recognize all titles in return for a portion of the profits. Similar arrangements are under negotiation with Russia and China. The shareholders are sufficiently international to prevent aggression from other countries who might claim a violation of the 'open door.'

"A report made for the United States department of commerce calls attention to the fact that thus far the several millions of dollars worth of ore already marketed were taken from placers in a comparatively restricted territory thirty miles wide by fifty miles long. The rest of the 250,000 square miles have hardly been prospected, although there are known to be other gold placers here and there which have been worked in a small way by primitive methods."

Here we have the Hutuktu of Mongolia granting a concession covering the rather insignificant area of 250,000 square miles, to a company whose shareholders are sufficiently international to prevent aggression from other nationals who might be tempted to jump a claim or so in this *eldorado*. It would seem that this enterprise has been incorporated under American laws. Now the American government was very emphatic in its stand during the consortium negotiations that Mongolia was a *most important province of China* and could not be considered apart. It would seem, therefore, that for such a concession to have proper legal standing, its charter should be derived from the Chinese government and not from his serene highness, the Hutuktu. But neither China or the Hutuktu at present seem to have any great say about things in Mongolia, for we find the Soviet holding down the capital at Urga and wielding a good sized club, over those unfortunate Chinese foolish enough to believe they have any rights in that territory. If reports from Urga are to be relied upon, the majority of the Chinese are now "riding the dragon" and the Mongolians are burrowing into holes in the Gobi desert. The reds reign supreme. From the Peking story it would seem that the international Mongolyor company is taking no chances and will forego a good slice of its profit to grease the Chinese and Russian governments, in order to obtain their sanction to the concession. However, the dictum of the state department still holds good: "*Mongolia is a most important province of China*," hence any document worth the paper it is written upon, must bear the great seal of the Chinese government, and any concession in Mongolia that has to pay tribute to the Mongolian and Soviet governments is contrary to the fundamental principle involved in the sovereignty over this territory. If such a concession signed by the Hutuktu holds good, then the Cassel concession covering the coal mines of Kwangtung is also legitimate.

The Mongolyor and Sinclair concessions are not all. The Vanderlip concession is still very much in evidence in any discussion

of American "rights" in these territories, and we find Mr. Vanderlip hard on the job, working hand in glove with Mr. Svirsky and High Adviser Anderson. In a recent interview, also published in the Hearst newspapers, Mr. Vanderlip reminds us that:

"Both Russian and Chinese statesmen have agreed that the designs of Japan in the Asiatic continent (Siberia and China) must be blocked. Japan, by repeated acts of aggression in Vladivostok, is solidifying Russia against the Japanese and is drawing Russia and China together into a union that one day will drive the Japanese from the eastern coast of Asia. While none will predict when it will come, nevertheless there is a feeling that war is brewing. The time will come when Russia will have completely recovered and will be able to supply China with all the ammunition she needs to make war with. Russia and China together could sweep Japan from the Asiatic coast."

If Mr. Svirsky's logic is sound, the United States must protect the rights of its citizens in *all* parts of the world, so if we are to drive the Japanese out of northern Saghalien to enable the Sinclair Oil Company to work the concessions granted by the Soviet, by the same logic the United States must defend the Mongolyor Company and drive the Soviet out of Mongolia, and when some adventurous American digs a hole in the Pienmah district, strikes oil or finds the mother lode west of Tachienlu or out on the southern borders of Sinkiang, and obtains a concession to work his claim, the American army will have to be mobilized, the fleet ordered to the English channel, while the Yangtze patrol will steam up to Suifu and beyond in order to induce our festive cousin, Johnny Bull, to pull in his horns in Tibet.

Congress should keep this in mind when voting on the next army and navy appropriation bills. We never can tell when the high board of strategy sitting secretly in Peking will create a situation that will compel us to fight for our rights at places in central Asia which will call for a minute inspection of all the maps in the world to properly locate the seat of trouble.

Of course, Mr. Roy Anderson's appeal for an American-Russo-Chinese coalition can have nothing in common with a mining company operating under a Sino-Russo-Mongol charter. The reference to other countries who might claim a violation of the open door, in conjunction with Mr. Anderson's solicitude about the necessity of American intervention in case Japan blocks the red program in Manchuria, is suspicious at any rate. By the way what are the names of those great American corporations operating in China represented by Mr. Anderson?

That Secret "Alliance"

A PROPOS of that secret alliance and plan of campaign concocted so quietly in Peking that Americans knew nothing about it, let us follow some of its possible ramifications. The Chinese publicity system in the United States has annexed Cornelius Vanderbilt, Jr., and we find him "spilling the beans" in a long syndicated article appearing in the Hearst newspapers of November 12. Vanderbilt leaves nothing to the imagination; he jumps right into the fray from the beginning. Listen:

"JAPAN dreads an awakened China!

"The sleeping giant of Asia is rubbing the slumberdust from its eyes; it will shortly stretch its arms and yawn a bit. With an almost vicious suddenness, China may be expected to leap from her couch of the ages as one stung by the biting flames of oppression and demand, at the point of the bayonet, the return of stolen properties and compensation for the outrages committed upon her.

"It will be a hard day for the little imperial island empire of Japan when young, strong and revenge-driven China finds herself ready to call upon Japan for an accounting of the Nipponese stewardship of the Orient."

Vanderbilt then goes on to eulogize Dr. Wellington Koo, incidentally sheds light on why China will become so extraordinarily active and makes clear just how the American government is to be brought into this great war when revenge-driven China demands of Japan the return of stolen properties that is, the Kwantung leased territory. First in the new order of remarkable Chinese leaders is Dr. Wellington Koo, says Mr. Vanderbilt. "One of Koo's first acts after his return to China was to brazenly announce that China would seek the return of the Kwantung peninsula next year.

"The Liaotung lease was secured by Russia for a period of 25 years, was wrested from Russia by Japan in the Russo-Japanese war, after the historic siege of Port Arthur, and in 1915 was taken from China again for 99 years by the Japanese, through the operation of the infamous 21 demands.

"The United States stands morally opposed to the 21 demands, which may cause Dr. Koo's administration to call upon this government next year for support in his claim against the island empire. The claim is held by Dr. Koo that the original Russian lease expires in 1923 and that the Japanese rights were secured under duress.

"Naturally, Japan will never consent to the loss of this peninsula, which since 1905 she has nursed into one of the most rapidly growing sections of the Asiatic mainland.

"Dr. Koo's startling statement fairly caused the Tokio foreign office to rock in dizziness.

"Able abetting the new Chinese foreign minister is Dr. Sao-Ke Alfred Sze, the Chinese minister to the United States. Dr. Sze, who is considered the most highly trained diplomat of the Chinese diplomatic corps, is counted upon to swing the United States into line to support Dr. Koo's claims.

"The United States will probably refuse to take sides, although public opinion in America may force this government to openly declare itself."

Here we have one working of the secret plan of campaign that was to make the United States the ally of China in a war with Japan. Dr. Koo was to call upon Japan to get out of Kwantung, and when Japan declined to get while the getting was good, the sleeping giant would rub his eyes, yawn loudly, stretch his arms, jump from his couch, grab his trusty bayonet and jab Japan a few times to facilitate her movements. In preparation for this sudden awakening of China and to be sure that her leap with the bayonet would be effective, public opinion in America was to be worked upon in order to force our government to openly declare itself, which means, to line up on the side of China in ejecting Japan from Kwantung. As an insight into the manner in which the United States might be railroaded into war, the story has its moral.

Why Not?

It surprises most Americans, says the "Brooklyn Eagle," to read that the United States army has established a "separate command" for "the American forces in China." What are we doing there? What are we doing in Nicaragua? There is commonly war-provocation in peaceful invasion by uniformed rifle-carriers."

DON'T you know Brother Howe that we are going to drive the Japanese out of Northern Saghalien, then prod the Bolsheviki out of Mongolia, ally ourselves with China and send Japan packing out of Kwantung, call the British bluff in Pienma and in Tibet, and then if we have any regiments left over and a few loose dollars in the treasury we are going to police China, take over her foreign obligations and defy the world to pry us loose from the new *eldorado*?

Great Britain is preparing to convert her share of the Boxer indemnity into an educational fund. Japan is only waiting for the organization of a stable government to do the same, in fact, the powers are literally falling over themselves in their haste to join the procession and forgive and forget the lesson of the Boxer year, but—this forgetfulness does not extend to the withdrawal of our troops from Peking and Tientsin. The road from Peking to the sea simply must be maintained open.

No sensible American would for a minute believe any of the stories set in circulation by Sun Yat-sen's publicity bureau. But one never can tell. The stories from Canton state that shipments of German arms for the southern government which were refused permission to land by the commissioner of customs when Dr. Sun was at the head of affairs in Canton, have found an easy entrance under the new *régime*. Many millions of British money were to have poured into the treasury of the Canton satrap, and altogether, according to the Sun publicity bureau, the situation in the south is very similar to that which we have been led to believe exists in Manchuria, with the difference that instead of Japan supplying funds and arms to Chang Tso-lin, here it is the British who are behind Chen Chiung-ming.

It is hardly two years since an active American concern slipped past the vigilant eye of Hongkong and the British commissioner of customs at Canton a complete up-to-date arsenal for Sun Yat-sen. We were solemnly assured by one of the highest officials of the southern government in Canton last year that a British steamer was at that moment unloading arms and ammunition at Kowloon for the northern forces. We are now told that the British authorities in Hongkong are moving heaven and earth to discover contraband arms, turning over all the coal in the bunkers of an American steamship to uncover fifty odd Winchesters and a store of cartridges. Another enterprising American has been arrested at Hankow for diverting the destination of some aeroplanes originally intended for peaceful flying in Fukien. We learn that an American missionary society operating in Szechuan has voted to purchase a num-

ber of planes to facilitate the work of spreading the gospel in that interesting and thickly populated province, and incidentally, the scene of the next spring drive on the part of Wu Pei-fu and his cohorts.

There is really no telling what the future holds for us. The time may arrive when the American army may disembark somewhere in South China and our fleet blockade Hongkong in order to persuade our British cousins to quit monkeying with that ponderous old door to Kwantung province. Or, the British may become exasperated over Americans beating them at the game, and we may be haled before the tribunal of the league of nations and soaked for an indemnity that would automatically reduce some of the allied indebtedness, for permitting Americans to supply arms to Sun Yat-sen and his valient armies.

Then again, we must keep a weather eye on Japan. Notwithstanding the fact that her government is determined to keep its "Hands Off" in China, that under no conditions will it send further troops to this country or act as the policeman for other powers; that its cardinal policy at this time is to re-establish cordial and intimate relations with China, she may have something concealed up those baggy sleeves of her *kimono*. To forestall any contingency, we must reinforce the American garrisons in North China and keep a separate military establishment on the ground to see that Japan puts nothing over.

The air is filled with wars and rumors of wars, with America and Britain alleged to be backing Wu Pei-fu and Japan accused of supporting Chang Tso-lin. There may be another spring drive in the north, and the armies of the overlord of Manchuria seek to carry the fight into Chihli, which means using the Peking-Mukden Railway, thus obstructing the free exit from Peking to the sea. That possible menace to the lives of Americans in Peking and Tientsin could not be passed by lightly, and the American command in North China would have to carry out its treaty obligations by taking over control of the line and telling the sportive Chang where he got off. Or, the contrary may happen. The playful Wu may determine to take the offensive, and then, of course, there would be little opposition to his using the Peking-Mukden Railway for military purposes. A troop movement from Peking northwards carries no menace to the lives of Americans or foreigners in Peking. But on the other hand, as soon as the valiant Wu and his legions cross the rubicon, that is, the Great Wall, and begins to harass the equally valiant Chang in districts where the operations might interfere with the traffic of the South Manchuria Railway and endanger Japanese vested interests in Manchuria, the Japanese army would appear on the scene and advise the festive Wu to

betake himself and his armies back into strategic positions behind the wall. In which case, that separate American command in North China might well be cajoled into a position that would start off the fireworks.

It is a wonderful situation, fraught with wonderful possibilities. At all costs we must protect our "allies." They have drawn up a secret plan of campaign that will bring us in with both feet when the time is ripe. We should not disappoint them. The Chinese are most fortunate. They not only have the Boxer indemnities turned to their own account, but the good-natured American people who hav'nt the slightest idea of what is going on, are called upon to maintain a considerable military establishment in North China to protect them against any sudden change of heart on the part of "Brother Banzai." So there are any number of excellent reasons why we should have a "separate command" for the Ameri-

can forces in China. There are just about a hundred possibilities that the presence of our armed forces in that part of the world will be urgently needed at almost any old time during the next year or so. There is only one other place where we could have got mixed up in a first-class fight with quicker dispatch. We just missed our chance by declining a mandate for Armenia and Syria. But we are going to make up for this lost opportunity. We will muddle our way into it yet, if our Celestial "allies" and their "Advisers" have their way. So there is no reason for the *Brooklyn Eagle* or other suspicious Americans to wonder what we are doing in China. We are simply on the job, and as we have apparently made up our minds to be the policeman of Asia and the "protector of China" the sooner the whole general staff is transferred to Peking the better will be our chances for victory. Let's make a workman-like job of it. Why not?

Saving the Nation

CHINA is bankrupt financially, politically and morally, betrayed by her military overlords and sunk in a morass of helpless dependence upon the foreigner. The temporary hope of China may lie in the rise of a strong man, the discovery of a financial genius or some coalition of parties, but in the long run the salvation of the country must rest upon an enlightened public opinion. Pending reorganization, the establishment of schools and raising the intellectual standard of the people, the essential element to the well-being of the nation must be supplied by the student and merchant classes. "The enlightened public opinion China," which gave birth to the boycott against Japanese goods was engineered by the student federations, the guilds, the street unions and other bodies. This movement developed into a nation-wide secret organization called "The Save-the-Nation-and-Weep Society." Whenever a Chinese shop-keeper persisted in selling Japanese wares, a mob of the secret society gathered at the shop door, fell on its knees and began wailing and moaning. After a few hours of this musical persuasion the shop-keeper became intensely patriotic and burnt his Japanese goods, or, the "saviors" sacked the premises and made their own bon-fire of the boycotted wares. It was very effective.

This society is now being disbanded since Japan's policy has changed into one of sincere friendship towards China. With it will go public opinion, such as it is. We suggest to its leaders that its work has only just commenced.

If a list were compiled of all official millionaires who have robbed the nation for the past twenty years and the full facts of how they accumulated their pile published in the Chinese newspapers and public opinion appealed to in order to come to the rescue of the nation in the same manner as the Japanese boycott was engineered, it is quite possible that remarkable results would be obtained. At least, we would have a real test of the force of Chinese public opinion.

We suggest, therefore, that the patriotic labors of "The Save-the-Nation-and-Weep-Society," go on. Its organizers should spread the story of China's present plight and persuade the masses to work in harmony with them. If the Chinese are ever to help themselves, now is the time. Japanese goods were boycotted amongst other things, because of Japanese loans to the Anfu clique, but we have never heard of any movement to boycott the Anfuites or bring pressure to bear upon defeated *tuchuns* and retired boodlers to compel them to make restitution of their ill-gotten hoards. Now if great mobs would surround the houses of grafting officials and begin wailing and moaning, to the tune of "Where Did You Get It" (in Chinese music) and manhandle a few of the real culprits instead of Peking officials who are not to blame for an empty treasury, a proper respect for public opinion might percolate into

the heads of other grafters and pave the way towards future official honesty in the handling of public funds. If the laws of China cannot protect the people from these rascals the last and only remedy is the force of public opinion expressed through personal visitations to the homes of the robbers.

The names of high officials charged with selling their country to various foreign powers or syndicates in the past twenty years and looting the provincial treasuries are no secret. Their huge personal fortunes are still intact. In any other country the question, "Where Did You Get It"? would be asked in a manner that would elicit a quick response and quicker restitution.

This may sound like cynical advice. However, we recall not many years ago, when the countrymen of Chihli province desired to register an emphatic protest against the Peking-Mukden Railway for raising dykes which diverted the flood waters to their lands, they swarmed on the railway track, laid down on the rails and challenged the engineer of the train to run over them. They remained encamped on the road bed until their protests were heeded. We do not believe that any serious force would be applied against any similar mob in China standing up for the rights of the people. We have seen how easy it has been to organize strikes that worked great injury to foreign vested interests in China. It proves that the latent power to achieve their purposes rests in the hands of the people. If they would divert these energies to their own officials instead of venting displeasure on the foreigner, the world would loudly applaud this exhibition of sane public sentiment.

If such methods could succeed in the matter of the Japanese boycott, in the various strikes and in the campaign to destroy the Anglo-Japanese alliance, why should they not prove equally effective when applied to domestic problems? For just so sure as China drifts into bankruptcy and foreign governments take measures to safeguard their loans, an anti-foreign campaign and boycott will be engineered in order to divert attention from the real culprits. All this can be averted by a save-the-nation campaign launched at this time.

Such an exhibition of Chinese public opinion would make a great hit and fill the front pages of every newspaper in the world. It would do more to restore confidence in China's future and credit than the allocation of the land-tax as security for further loans.

* * *

Since writing the above, the Chinese general chamber of commerce of Shanghai has taken the initial step towards exposing the treasury looters by drafting a telegram to the parliament at Peking demanding the publication of a report of all loans contracted by the government since the establishment of the republic in 1912. The chamber demands the full details of how the loans were secured,

the amounts and for what purposes, so the entire nation may scrutinize the manner of their distribution and bring the grafters to justice. It is the plan of the chamber to organize a national committee for the purpose of investigating the distribution of the funds and ascertain the cases of bribery and corruption that has taken place since the establishment of the republic. In the case of all loans whose character and uses are justified the people will agree to become liable for the repayment, but in cases where the loans have been concluded for the sake of filling private purses or where the proceeds of the loans have been embezzled the chamber demands that the offenders, without discrimination, should be prosecuted by the law, severe punishment meted out and their private property confiscated by the government.

This is a step in the right direction, and if supported by all the elements which at present go to make up Chinese public opinion, and parliament forced to take such action, it will help towards restoring faith in China's promises to pay. However, this is only one phase of the situation, and simply goes to support our statement that attention will be diverted from the real culprits and the blame attached to the foreigner. Undoubtedly, foreign loans to the Peking and provincial administrations have materially contributed to bring China to her present deplorable financial condition, but the real root of her troubles springs from and derives nourishment from the traditional corruption of the Chinese scheme of government. More millions have been stolen and appropriated into the pockets of the *tuchuns* from the proceeds of internal taxation and extortion than have been misappropriated from foreign loans. We see in this attitude of the Chinese general chamber of commerce exactly

what we feared; when China is actually faced with bankruptcy and foreign control over the customs and salt surplus, an attempt will be made to lay at the door of the foreigner all the woes that have befallen the country in order to deflect attention from a system so ingrained in the Chinese character and methods of government that it cannot be uprooted.

It is eminently just that officials who have embezzled the proceeds of foreign loans be brought to justice and their private properties confiscated by the state, but for this campaign to meet with the full sympathy of the foreigner and pave the way for the rehabilitation of China's credit abroad, it must cover the wholesale misappropriation of provincial and central government revenues by the *tuchuns* and their satallites. The loan mongers of Peking have been forced to the extremity of raising foreign loans to make ends meet, by the refusal of the provinces to remit funds to carry on the government. The dishonesty of the *tuchuns* and their henchmen are responsible for the breakdown of the central administration at Peking forcing it to resort to sharp practices to keep alive a semblance of government and maintain the status of China in the comity of nations. Our advice holds good. Prosecute the dishonest loan mongers and grafters, but make the *tuchuns*, the provincial treasurers and other freebooters disgorge. To concentrate a campaign of official purity solely upon officials responsible for raising foreign loans can only result in obscuring the main issue, working up an anti-foreign sentiment throughout the country, and covering up the real evil. Let the weeping and wailing, the gnashing of teeth, and other persuasive demonstrations outside the yaméns and palaces of retired *tuchuns* and boodlers proceed.

Undermining the Consortium

U. S. HOLDS UP CONSORTIUM

SAN FRANCISCO, November 23—Operation of the international consortium, intended to stabilize China's trade and finance, is being held up through the apathy of American bankers and their desire for better security than now is apparent, Julian Arnold, commercial attache of the American legation at Peking, told a gathering here. (*Press Dispatch.*)

HERE we have an illustration of the difficulties surrounding the working out of any intelligent American policy in China. The state department fought a determined diplomatic battle to establish the consortium and abolish the spheres of special interest in order that American capital might participate in the development of China. The consortium is headed by the most experienced bankers of America, the best judges of the value of a foreign security on the American market. Yet its policy is openly condemned as too harsh, while Mr. Arnold goes so far as to make the absurd statement that the present instability of China arises from the failure of the consortium to depart from basic banking principles in lending money to a government whose credit is ruined and whose revenues are mortgaged to the hilt for previous loans. It is no secret that an underhand campaign to discredit the consortium has been in operation for over a year, the criticisms being directed not against the consortium as a whole, but against the very able representative of the American group who refuses to be budged from his common sense point of view by appeals to sentiment.

The remarks of Mr. Arnold before a gathering in San Francisco appear to be the first public utterance on the part of an American government official criticizing the consortium, that is, the American group representative in Peking. The attitude of the American commercial attaché will provide ammunition to others interested in breaking the influence of the consortium, and give official sanction of the department of commerce to a campaign that would throw open the Chinese field to a flood of disastrous loans. Once the

safeguards surrounding loans to China are dispensed with, the road will be cleared for unscrupulous financial agents and loan brokers to deluge the markets of the United States with securities upon which the investor could never hope to realize.

It would be difficult to reconcile Mr. Arnold's implied recommendations with actual facts. The Pacific Development loan to the Peking government was advanced without security; the Chicago loan had ample security but no means of safeguarding the investor; several American firms have sold many millions of dollars worth of materials to the Chinese government without security. The consequences are seen in the appointment of a special committee of American business men to unify Chinese financial obligations to American bankers and manufacturers and in the financial embarrassment of the most important American trading concern in China.

An elementary knowledge of the actual conditions in China and of the trust character in which a bank's resources are held, together with the impossibility at any time in the last two years of selling Chinese government bonds in the American market, should be sufficient to fully justify the clear-visioned view-point of the American group representative in Peking and disprove the statement of the American commercial attaché.

The real danger attached to such statements on the part of American government officials lies in the possibility that the other partners in the consortium may arrive at the conclusion that American diplomacy forced through a combination for its own political ends, and when it failed to function according to expectations Americans were the first to advocate measures tending to destroy

its usefulness. When Dr. Paul S. Reinsch, the acknowledged "father" of the new combine, tells an audience in Peking that unless the consortium lends funds to the present government, China will have to seek accommodation from independent bankers, and the American commercial attaché criticises its usefulness in the above terms, the other powers who accepted the American invitation to pool their interests, have a reasonable justification to doubt our good faith in forcing their positions. The same conditions have existed in China since 1918, when the new consortium was proposed by Americans. What was wise then, is ten times wiser at this time.

* * *

A Disaster Averted

THE disastrous effect upon American interests in China arising from undue confidence in the ability of the Chinese government to meet its obligations is emphasized by the present activities in New York to find a practical plan to enable the Pacific Development Corporation to carry on. The plight of this corporation is occupying considerable space in American financial papers. The details of the much discussed reorganization plan were made public on December 14 and at the same time a special meeting of the stockholders was called for December 20 to vote on the proposals formulated after five months work to evolve the best method of continuing the Oriental trading business of the corporation and obtain a substantial extension of its obligations and those of its subsidiary companies.

According to notices appearing in the New York newspapers on December 13th, a special meeting of the stockholders of the Pacific Development Corporation was called for December 20th for the purpose of considering plans for reorganization. The Pacific Development Corporation is the holding company for Andersen, Meyer & Company of Shanghai, the Pacific Commercial Company of Manila, and a number of other concerns. Although nothing definite has been heard to date in Shanghai regarding the results of the meeting of stockholders on December 20th, local officials of Andersen, Meyer & Company stated that they are in receipt of cable advices that reorganization is proceeding satisfactorily.

The main feature of the reorganization plan originally announced included the separation of the three companies and the opening of separate offices in New York by Andersen, Meyer & Company and the Pacific Commercial Company of Manila. The plan also included refinancing for both the Shanghai and Manila companies and possibly the liquidation of the holding company. The Pacific Development Corporation, according to report, has been seriously embarrassed in its recent operations owing to the default of the Chinese government upon a loan of G\$5,500,000 extended in 1919, upon which neither interest nor principal has been paid for approximately one year.

In view of this embarrassment caused to the Pacific Development Corporation by reason of the default of the Chinese government, it has been considered to the best interests of the Oriental Trading Companies—Andersen, Meyer & Company and the Pacific Commercial Company—to segregate their respective interests from the holding company.

The future of Andersen, Meyer & Co., Ltd. is exceptionally bright as the company undoubtedly has an excellent good will in China in the ability to sell machinery and engineering supplies. Need for a large amount of equipment exists but the ability of the Chinese to secure this equipment on terms satisfactory to the supplier depends on when and how soon the existing condition in Chinese government finance and the disorder incident to the revolution now going on are worked out.

We had this situation in mind when we wrote the editorial appearing in the September (1922) number of THE FAR EASTERN REVIEW entitled "Facing the Facts." "If American firms are forced into bankruptcy by reason of the failure of the Chinese government to pay its debts for merchandise and materials, or because of its unwillingness to issue notes in order to enable its creditors to seek relief from the carrying banks, the effect upon China will be disastrous. Unless these unsecured debts are paid within a reasonable time, foreign firms in China can prepare for another catastrophe before which the crash of 1920 will appear insignificant."

In the face of a situation which has only narrowly averted disaster to the largest American trading firm in China, it seems stupid in the extreme to invite another flood of griffins to enter the field until conditions improve.

The Japanese Decision

DENIED the right of emigration to and citizenship in the United States, barred from Canada, Australia, New Zealand and British South Africa, treated as undesirables in Asiatic Russia, prohibited from owning land and settling outside the treaty ports of China and confronted on all sides with suspicion and a campaign launched to deprive them of the fruits of past sacrifices, with a population increasing at the rate of 700,000 a year, the *Chicago Tribune* commenting on the reception in Japan of the recent United States supreme court decision, says that the Japanese are peevish, seeking a cause of irritation and strife. It would seem that any other self-respecting nation laboring under such handicaps would be peeved also, especially when, in addition to the above impediments to their struggle for existence, Japan is made the target for all the abuse

arising from China's unfortunate condition, and foreign diplomacy, publicity and propaganda is directed towards obstructing her peaceful penetration into the only logical place in the world remaining open to her activities. The Japanese may accept the decision of the U.S. supreme court with equanimity, there may be no disposition on the part of any class to display an ugly spirit, but altogether aside from the intrinsic merits of the decision, it must bring considerable dissatisfaction and chagrin coupled with regret that they should be so consistently maligned and attacked at a time when they are earnestly striving to fall into line with the more liberal spirit of the advanced western nations.

Although there are distinct differences of opinion editorially expressed in the American newspapers concerning the merits of the decision, it is generally agreed that the right of congress to

determine who shall and shall not enjoy the privilege of naturalization and citizenship is most important and must be upheld. While perhaps the Japanese have no cause to feel aggrieved because of the fact that this decision is no reflection on their culture or standing, it must necessarily tend to influence them to seek closer relations with other Asiatics.

If Japan has a real grievance it is not so much because of the decision of the supreme court as it is the fact that Caucasian opposition is carried to the extreme of circumventing their legitimate activities on the mainland of Asia, amongst peoples who come under the same ban. The decision, if not modified by congress, means that Japan must seek a future home for her surplus millions in Asia. And here the fight against them is waged with no less severity than in the United States, with the difference that at home it is racial while in Asia it is commercial and political.

The *New York Evening Post* says the decision does not mean that there can be no such person as an American citizen of Japanese blood. Japanese who are born in the United States and subject to its jurisdiction are American citizens by the fourteenth amendment like all other persons so born and governed. Even a Chinese who is in that category is an American citizen. The fact that his parents cannot become citizens has no effect upon his status whatever. Nor can any state change this fact. The fourteenth amendment was adopted for the very purpose of preventing states from excluding anybody from citizenship, and while it was aimed primarily at discrimination against the negro, it includes discrimination against any other race as well.

Whether or not we should alter our attitude and admit to the privilege of naturalization those Japanese whom we permit to enter our country is another question, says the *Post* which continues:

"Mr. Roosevelt believed that we should. In his annual message to congress in 1906—the year in which we passed the law which figures in Justice Sutherland's opinion—Mr. Roosevelt recommended that 'an act be passed specially providing for the naturalization of Japanese who come here intending to become American citizens.' The recommendation was not heeded. But Mr. Roosevelt was right. To refuse naturalization to Japanese whom we allow to settle here is not only an illiberal policy; it is also inconsistent with our general principle that permanent residents of this country should be an integral part of our citizenship."

The *New York Times* in discussing the decision emphasizes the fact that Justice Sutherland took pains to avoid saying anything to wound Japanese pride. After explaining that the sole duty of the court was to ascertain and apply the meaning of the act of congress, he was careful to acquiesce in what had been said by counsel in praise of Japanese culture and prestige, maintaining that there was no intent to assert any offensive racial distinction.

"This," says *The Times*, "may seem a little forced to the Japanese themselves, but to Americans, at any rate, it ought to deepen the sense of obligation to bear themselves toward the Japan-

ese in this country and elsewhere with all fairness and courtesy, and to respect all the rights which they have under international law and special treaties. Particularly to those Japanese who were born in this country and hence are, under our constitution, citizens of the United States, unless they choose to expatriate themselves, should every consideration be shown."

Inasmuch as it is the function of the supreme court to interpret the laws and not to justify them, the decision, the *Chicago Tribune* points out, has no bearing on the policy of exclusion. As Justice Sutherland wisely pointed out, there is no implication of inferiority in either the decision or the law. Our policy of exclusion is not based on any assumption as to relative levels of culture or of race quality or character. It is based, and based solely, upon difference—difference of race, culture, and economic standard. This difference is so great as to make fusion and inclusion impracticable. Intermarriage, it is American conviction, is not good for either race or for the individuals of either race, though in exceptional cases intermarriage may be successful. This does not imply that the Japanese are inferior to the Americans in race or culture, and there is no occasion for offense to Japanese pride. Another basis of exclusion is economic. The difference in standard of living gives the Japanese an advantage over the American from which the latter has a right to defend himself."

The *Baltimore American* in reviewing the decision emphasizes the fact that no slight is intended toward the Japanese as a race, and it hopes that progressive and powerful nation will soon accept unanimously the decision in good part, with an understanding of our own viewpoint of the fundamentals involved. There is no occasion, the American insists, for sensitiveness, and if the situation were reversed it thinks Americans would accept a similar decision by the Japanese courts with unmoved emotions.

The *Buffalo Express* characterizes the decision as a law of narrow vision, unjust and the principle embodied unsound. Americans, it adds, should be ashamed to discriminate against intelligent, law-abiding Japanese when they admit almost everybody to citizenship. "It is not likely" concludes the *Express*, "that the Japanese government will make any diplomatic protest, but if Japan counters with some retaliatory discrimination against Americans, we should hardly be in a position to say much about it."

The *New York World* sees nothing startling or sensational in the decision as it follows the beaten path adhering to the rule that the privilege of naturalization be accorded only to white persons and those of African nativity and descent. "It lies within the discretion of congress to raise the bars against all but Caucasians and Africans, for reasons good or bad, but expressed in the form of law. It is thus entirely a matter of policy."

When the World was Young

WE learn from the *Editor & Publisher* that "Hank" Cary is dead. "His passing will be mourned in hundreds of newspaper offices and in the out-of-the-way places of the world where correspondents of another day-seekers of adventure who won fame in the latter days of the last century-foregather to spin yarns."

This item of news means nothing to our Far Eastern readers. Outside of a few army officers in the Philippines not a dozen men

in Asia ever heard of Henry N. Cary. It means much, however, to American journalists and their British comrades of "98" who learned to love the man who has passed on. He was a real newspaperman thoroughly trained from the ground up according to the rules of a rapidly passing school, the outstanding characteristics of which were an intense Americanism, news-getting under the most hazardous circumstances, combined with a spirit of comradeship and loyalty to colleagues which bound together in one great

brotherhood the correspondents of the Cuban revolution and the Spanish-American war. During the Santiago campaign Cary went to Cuba to take charge of *The New York World* field staff, and as a war correspondent won fame and the esteem of all his colleagues. *The New York World* field staff of "98" was not large, but it made up in efficiency what it lacked in numbers. They were all willing to take desperate chances, and, if necessary, to pay the price, the highest price of all, so that their paper got the news first. They held no monopoly of this spirit, however; there were others, daring resourceful spirits of the opposition whose names are now famous in the annals of American journalism. Many of them have passed on leaving the record of their exploits in the musty old files of forgotten newspapers and their memories enshrined in the hearts of surviving comrades. Of the field staff of *The New York World*, two survive.

"The Red Badge of Courage"

At the head of the little group stood a famous young author, one of the rising stars of emotional literature, frail in appearance, as full of whims as a *prima-donna* and as difficult to manage, with a heart soft and tender as a woman's, full of sympathy for life's unfortunates, yet every inch a man, eager to experience the first thrills of being under fire. Such was "Stevie" Crane, the genius who penned the realistic "Red Badge of Courage" before he ever heard the whizz of bullets or watched a man slowly pouring out his life blood on the field of battle. He plunged into the thick of the fighting, was here, there, everywhere; with the marines on the beach at Playa del Este, with Wood at Guasimas and with Chaffee at El Caney. His delicate constitution gave way under the strain: sick with fever and dizzy with delirium he staggered through the campaign and featured its thrills until he broke down and could go no further. He was shipped home on a transport cursing his luck, raving at his comrades and crying loudly for . . . "Pickles." The exposure hastened his end. He died within the year at his manorhouse in the south of England. "Stevie" won the badge and paid the price.

Francis H. Nichols

Francis H. Nichols, "Nick," they called him, the jaunty, debonnaire, matter of fact, but deadly efficient New York reporter also received his baptism of fire at Santiago. "Nick" didn't know the meaning of the word "fear." Smoking his old briar pipe, he strolled as unconcerned up San Juan Hill with the Rough Riders, with men falling all around him, as though he was covering a parade marching up Fifth Avenue. Not until it was all over could he be made to realize that he had been in the middle of it, that he was the hero of the day, the only one who had the real story of the battle. "You fellows quit joshing me," he said, "it was nothing."

In the same happy-go-lucky spirit he came to China during the Boxer troubles, journeyed through the interior on a special mission for the red cross and wrote the classic, "Through Hidden Shensi." He returned to China the following year with the set purpose of hiking through Szechuan and the "Forbidden Land" to Lhasa, and spent several months at Chungking learning the language before venturing into the unknown. While climbing up the "Roof of the World" from the east, Younghusband with an army behind him was marching up the Chumbi valley from the south to force an entrance into the capital of the Dalai Lama. "Nick" tackled the job single-handed. His bones lie rotting in a cairn somewhere along the grim, frozen borderland of Tibet. He died, the dirty lamas said, from exposure, from pneumonia. They lied. He was alone, unarmed, and they poisoned him. "Nick" paid the price.

Sylvester Scovel

Towering high above his companions in efficiency and dash stood Sylvester Scovel ("Harry" to his intimates) a strikingly

handsome, lovable dare-devil whose exploits filled the front pages of *The New York World* for over three years. War journalism may produce another "Bull Run" Russell, another Archibald Forbes or Frederick Villiers, but there will never be another Sylvester Scovel. He also worked alone in a war where no quarter was given, against an entire army sworn to kill him if captured. He was the first and last of his kind. Journalism don't produce many like him and if it did, they would never have another opportunity of displaying their talents. Scovel developed a new type and wound up his career in a manner that closed the door for anyone to follow him. He was always ready to stake his life to obtain a real piece of war news or score a beat for his paper. He also knew not the meaning of the word "fear." Standing on top of his horse like a circus rider with field glasses glued to his eyes to better view the fights between Cubans and Spaniards, he became the idol of the Cuban army; he rode by the side of Maceo and Gomez in over a hundred battles; at Maltiempo, at Cacarajicara, at the Rubi Hills and other bloody fields he was in the thick of the slaughter; he crossed the "uncrossable" trocha in Pinar del Rio with an escort of only eighteen men: passing in and out of the Spanish lines like a phantom with the entire secret service organization of Spain at his heels hungry to earn the reward for his capture, dead or alive; the hero of many hair-breadth escapes from capture and death which modesty forbade relating, he finally slipped in a rash effort to "scoop" his chum, and the Spaniards got him. Quick work on the part of *The World* and the entire weight of the American government obtained his release from the prison whose other exit led to a blank wall and a firing squad. He forced the Chilkoot Pass during the Klondyke gold rush, was ubiquitous during the Santiago campaign and rounded out a meteoric career resenting an insult from "Pecos Bill," the commander-in-chief of the American army, by punching the latter on the jaw before all his staff at the surrender of Santiago. This finished Scovel as a war correspondent. He narrowly escaped being shot down in his tracks by the provost-marshal, and only the fear of public opinion and kicking up a rumpus in the United States saved him from a drumhead court martial the next day. His companions had a hard time convincing the irascible and rotund old Indian fighter that deportation would be much better than a firing squad. "Harry" Scovel rests in a cemetery in Havana. He failed to pull through an operation for an ailment contracted while campaigning in the swamps and forests of Cuba. He lies amongst the palms in the land he helped to liberate. Scovel paid the price.

Louis Seibold

There was also Louie Seibold, who is still in harness, standing at the head of his calling and sharing with "Sam" Blythe the distinction of being the highest authority on American politics and public men. Seibold's arrival at Santiago during the campaign brought a reinforcement to *The World* staff that doubled its news efficiency. A wonderful comrade.

The Cub

There was also a cub, "Brian Boru," Scovel nicknamed him (not much of a newspaperman in that constellation of stars), whose main occupation seem to consist in restraining his chum from sacrificing his life every time he came within gunshot of a Spanish fort or flying column. Scovel was chuck full of curiosity. His thirst for first hand knowledge was insatiable. He refused to take the Spaniards seriously until he had a regiment or a block house vigorously expressing disapproval of his presence in their vicinity or a band of *guerrilleros* hot on his trail.

The cub was different. The Spaniards potted him once from an armored car, they tracked him for days with blood hounds and pressed him so hard at another time, that they captured his assistant and cut his head off, thinking they had killed the cub. After that, the cub developed an unreasonable appreciation for rear-guard scenery. He was at all times opposed to his side-partner's propen-

sities for exploring the interior of outwardly peaceful looking villages and haciendas scattered around the Cuban landscape, in fact he acquired a most retiring disposition. There were times when he instinctively sought the lee side of a boulder, the shelter of a fat tree, a hole in the ground or a gully, or if these safety-first requisities to a war-correspondent's usefulness and longevity were not always properly scattered around the vicinity of trouble, he quickened the innate sagacity of his Cuban steed and headed a formidable rear-guard movement of the escort to more distant and tranquil surroundings. All to the intense irritation of Scovel, who on more than one such occasion threatened to spoil the countenance of the more cautious cub for foiling his attempts to break into the obituary column. The cub also broke down under the strain after the surrender of Santiago. Like Crane, they put him on a transport hollow-eyed, and emaciated with fever and carried him ashore at New York as they thought, to die. For four months his life was despaired of, but he came through it and lived. He almost paid the price. The Dons subsequently captured him. He is now serving a life sentence in a castle in Spain.

"Hank" Cary

The genius, the star reporter, the spectacular war-correspondent, the political authority and the cub leader of rear-guard movements, all had to toe the mark and for once in their young lives recognize a boss, taking their orders meekly from the quiet, genial comrade whose common sense and knowledge of what the office wanted brought greater efficiency into an organization that had to hump itself to maintain the prestige of its paper with only one snorting old filibustering tug-boat (the historical "Three Friends") to buck the fleet of palatial steam-yachts and swift dispatch boats working for the opposition. They did just that, and scored many scoops, thanks to the direction of "Hank" Cary.

His companions and colleagues of those days when *The World* was young will echo the words of the *Editor & Publisher*, "he knew how to make friends and keep them."

* * *

New Map of China

(PHILIPS' COMMERCIAL MAP OF CHINA, edited by Sir Alexander Hosie, published by George Philips & Son, Limited, 32 Fleet Street, London, E.C.4. Mounted on cloth and varnished with rolls, 50s. net: mounted on cloth and folded in French case, 55s. net).

Undoubtedly the best commercial map of China yet published. It has been carefully edited by the late Sir Alexander Hosie, the foremost British authority on commercial and industrial China. In the map folder, is a comprehensive handbook giving the essential data on area and population, inhabitants and customs, currencies, weights and measures, foreign relations, communications, import and export trade and trade conditions, modern industrial development, old and new names of cities and a complete map index.

The map itself is in five colours, 45-in. by 62-in., scale, 48 miles to 1-in. The scale is also given in kilometres and Chinese *li*. It shows the railways in operation and under construction and the districts where various staples and commodities are found. Amongst these are the animal and vegetable products, minerals and manufactures, each product being indicated on the map by a separate symbol of which there are 98. These symbols, being printed in red and royal blue, are easily distinguishable. Wherever space permits, the names of the animal and vegetable products are given in full.

This is the first map to be published with the new "Hsien" nomenclature (the new republican form) and for reference the older and more familiar forms are also inserted. The spellings throughout are those officially adopted by the Chinese Post Office.

The map also shows canals, steamer routes (with distances between ports), submarine cables, passes, caravan routes, telegraphs and wireless stations. Heights of land are indicated in feet at intervals.

Altogether it is a most valuable work, thoroughly in keeping with the reputation established by Sir Alexander Hosie, and that of the map-makers.

* * *

Famine Prevention in China

PLANS for the prevention of famine in China have been made by the executive committee of the China famine fund, of which Thomas W. Lamont is chairman. Two Chinese colleges have been endowed with funds to provide for scientific study and education in agriculture and forestry. The money for this work will be forthcoming from the balance left from the \$7,750,000 donated by the American people for the relief of millions of starving Chinese in the winter and spring of 1921. All demands on the committee from the Chinese have been met and the cash surplus amounts to approximately \$900,000.

Thomas W. Lamont made the following statement in New York on the aims of the famine fund trust:—

"After the committee had met all demands for famine relief in China, including those caused by the recurrence of want in the first half of 1922, there remained of the generous offering of the American people to the provinces of China stricken by starvation in 1920-21 a balance of approximately \$900,000. The executive committee has determined to devote this surplus to the prevention of famine in China, by scientific study and by education in agriculture and forestry.

"After consulting with the American advisory committee, organized at Peking under the leadership of the American minister, the plan to undertake famine prevention has been based upon the creation of a conditional trust, which is to last for ten years. Nanking University and Peking University have been selected as the educational centres of the work, and there will be placed in the hands of a trustee \$675,000 for the first named college, and \$225,000 for the second, as the trust funds to be used for the study and investigation of famine causes, prevention and relief and as a means there to for the education of the Chinese in agriculture and forestry.

"Expenditures from the principal of either sum can be made only with the approval of the China famine fund committee, which is to be composed of five American residents of China, serving without pay. Two of these committeemen are to be selected by the American minister to China, and two by the committee on reference and counsel, foreign missions conference of North America. These four are to select the fifth.

"The universities are required to inform the committee of all proposed expenditures and the committee has authority to revise them. Compensation from the fund is limited to those actually engaged in carrying out the purposes of the trust.

"There has been reserved from the two grants for five years an emergency fund of \$100,000 for use as a nucleus to start a campaign for famine relief in China should such an operation be necessary.

"At the end of ten years the China famine fund committee, created by the trust, may direct the trustee finally to surrender control of the funds to the two universities, in sums apportioned by the committee or if the administration by the universities has not been satisfactory it may withdraw them entirely and direct the trustee to apply them to other uses within the purpose of the plan."

The members of the executive committee of the China famine fund are Union N. Bethell, Graham Patterson, Dr. Robert E. Speer, Dr. Frank Mason North, Raymond B. Fosdick, John Price Jones, H. T. S. Greene, William H. Taft, Dr. Livingston Farrand, George Horace Lorimer, Galen L. Stone, John Jay Abbott, Festus J. Wade, Robert Dollar, Mortimer L. Schiff and Arthur B. Parker.

A Pioneer for Pacific Peace

Alexander Hume Ford

The Founder of the Pan-Pacific Union

DESTINED in the course of years to outrival in usefulness the Pan-American union as an instrument of international good-will and understanding, the organization that has grown and gathered strength at the "Cross Roads of the Pacific" is rapidly assuming an importance which bids fair to become one of the world's greatest institutions. The Pan-Pacific union embracing in its membership the great empires whose shores are washed by the waters of the Pacific, has a peculiar and far-reaching mission, thrashing out vital problems in an informal way at its annual conferences and other meetings which enable the governments concerned to formulate and apply policies assured of a hearty welcome by the other interested Pacific peoples.

In Washington and other seats of democratic governments, the officials in power adhere scrupulously to the basic law of popular government, keeping their ears glued close to the ground at all times to catch the first far-away murmur of public opinion. It may well be as the years roll by that this fundamental political rule will be modified in form to meet the requirements of international Pacific politics by listening in and paying attention to what Honolulu has to say. In this free forum for ventilating ideas and ideals, the voices of America, of China, of Japan, of Canada, Australia and the other free peoples of the Pacific are heard through their unofficial spokesmen relieved of all diplomatic restraint. If listened to by the governments concerned with as much interest as they display in catching the first rumble of home opinion, the way will be cleared for mutual understandings that will lighten the load of active diplomacy and make possible a thorough understanding between the peoples of the Pacific Ocean.

To mention the Pan-Pacific union, the name of Alexander Hume Ford comes automatically to the fore. Listening in on Honolulu, also means "keep your eye on Ford." Who is Ford? To begin with he is a bundle of energy, one of those hundred per cent. Americans whose forebears from England carried their full share of the load in transforming a wilderness into the great nation of to-day.

Born in Charleston, South Carolina, in 1868, on his father's side Mr. Ford was descended from Peter Ford, who arrived in Charleston harbor about 1668 with three ships and a grant and a royal patent of land for quite a portion of South Carolina. On his mother's side he is descended from the Humes, Earls of Marchmont, Scotland, and from many distinguished pre-revolutionary leaders, one of whom, General Christopher Gadstone, was a signer of the Declaration of Independence and a warm personal friend of George Washington. He was the first governor of South Carolina and it was through his efforts that the colony of South Carolina broke away from the British empire. One of the first flags of the United States was the Gadstone flag, a rattle snake on a yellow field and the motto "Tread on me and die."

Mr. Ford was educated at Charleston in Porter Academy, in a class with General Charles Summerall and others who have since become distinguished. He began life on the *Charleston News and Courier* and after the earthquake moved to New York City, where he was associated with the two grandsons of his father's lifelong friend, Senator John C. Calhoun. Later he went into newspaper work in New York and playwriting. Early in life he became a traveler, visiting most of the countries of the world. For a period of time after the Chicago Exposition he was on the staff of the *Chicago Daily News* with such men as Ray Stannard Baker, Peter Finley Dunn ("Mr. Dooley"), Trumbull White, George Ade and others who have become distinguished.

The basis of Mr. Ford's life work in the Pacific may be said to have begun in Chicago. He undertook the task of supporting a congregational minister, who he believed had been treated unjustly by his congregation because of his views, and Mr. Ford organized the militant church of Chicago. On the board of directors were Protestant clergymen, a Jewish Rabbi, a Catholic priest, and an Episcopalian bishop, and the agnostics represented by Robert Ingersoll. The Columbia theatre, the largest in Chicago, was used for the church services, and here Robert Ingersoll preached his only sermon, "How to Reform Mankind." In this church no one was compelled to give any donation. Its motto was "Deed not Creeds, act in this World, theorize in the next." Every member had to give two hours of his time at the call of the pastor, Rev. John Rusk, for the good of humanity. A hundred women pledged themselves to visit daily the police stations and rescue any women who expressed a desire to reform. As many physicians gave free treatment and in

the police stations there was a physician who took hold of the dipsomaniacs for there was a hospital organized by this church for the caring of alcohol and morphine fiends. It killed some and cured others, but there was never a complaint. Rusk was pastor of the church until he died. There was a chorus of 200 voices and an orchestra of fifty in connection with the church. Everyone gave his services free.

When Mr. Ford came to Hawaii to live in about 1907 it began to impress itself upon him that if Chicago men of all creeds and no creeds could get together to run an institutional church why could not men of all races and religions be brought together to bring the nations of the Pacific into real co-operative effort for the advancement of the interest of all. He spent a year in Honolulu studying the subject and the races. In the meantime he organized the Outrigger Canoe Club and revived the sport of surf-board riding. Starting with membership of less than a hundred and the ridicule of the old-timers who were certain that no white man could learn to ride the surf-board, the club has grown until it now has a membership of 2,000 men, women and children and half-a-dozen of the world's champion swimmers. The following year he organized the



Alexander Hume Ford

Trail and Mountain Club for the trappers and this now has a membership of several hundred. These two successes gave him confidence and brought him into contact with the men of all Pacific races. It was at the Outrigger Club that he gave a series of dinners to the leading men of each Pacific race to meet Jack London and discuss with him the great international problems of the Pacific. This led to the idea of the Hands-Around-the-Pacific Club and the movement was the beginning of the Pan-Pacific union.

About 1908 Mr. Ford made a trip around the Pacific with a commission from then Governor Walter F. Frear to begin the organizing of the Pan-Pacific union. T. E. Dunne of New Zealand and Percy Hunter of Australia took the leadership in their countries and branches of the Union were established with government backing. A conference was held in Honolulu and the governments of the Pacific selected that place as the conference centre of the Pacific because of its convenient location as a cross roads station, so Mr. Ford decided to make his home there. In 1914 he again made a trip around the Pacific organizing branches of the union in the Orient, and in 1920 he persuaded a party of congressmen to visit the Orient and establish points of contact with the leading men in the Philippines, China and Japan and here was established a series of branch organizations of the Pan-Pacific union with the heads of these governments as honorary presidents. In fact, to-day the head of every Pacific government is honorary president of the Pan-Pacific union and they are all personal friends of Alexander Hume Ford, the director of the Pan-Pacific union.

The first conference after the war was the Pan-Pacific scientific conference in 1920, when about a hundred scientists from Pacific lands met and organized to discuss the scientific problems of the Pacific. In 1921 Mr. Ford had the union call the first Pan-Pacific educational conference, which has been such a splendid success under the chairmanship of David Starr Jordan. He is at work with the new executive secretary of the Pan-Pacific union, Dr. Frank F. Bunker, in organizing a permanent Pan-Pacific press conference to meet every three years, the object of which will be to disseminate truthful knowledge to the world about Pacific lands. This year the Pan-Pacific commercial conference will be held in Honolulu under the auspices of the Pan-Pacific union and it is hoped that President Harding and the presidents and premiers of Pacific lands will be able to be present as guests of the Pan-Pacific union to establish points of contact among themselves that will be useful for all time to the people of the Pacific. A number of other Pan-Pacific conferences are scheduled to meet in Hawaii to establish points of contact between the leaders of thought and action in Pacific lands and there is a plan afoot to charter a steamer and take on a tour around the Pacific a hundred of the leading statesmen and others of Pacific lands, that they may grow to know each other and become acquainted with each other's countries. This has the backing of the leading statesmen of Japan and America and it is expected that conclusive arrangements will soon be made.

Alexander Hume Ford has been the leading worker in the Pan-Pacific union for more than a decade. He states that in organizing the work he believes that the Pan-Pacific league of nations might be brought about after thirty years of labor. Twelve years have already passed and such men as Woodrow Wilson, Warren G. Harding, Franklin K. Lane and Henry Cabot Lodge have expressed their belief that a world league of nations should have its beginning in the Pacific Ocean where the traditions are traditions of peace, and these men have given Ford their consideration and support. Franklin K. Lane was about to take the position of director-general of the Pan-Pacific union when he was called by death. Ford is now gathering about him the biggest men of the Pacific and the Pan-Pacific union is well established with financial support from the United States government, that of Hawaii, the Australasian countries, China and the Orient. In fact, all of the countries of the Pacific are members of the Pan-Pacific union, which is still an informal organization that thrashes out the problems of the Pacific

in an informal manner and does not commit the governments in any way, so that the governments are glad and willing to finance the Pan-Pacific union and send delegates to feel the way toward movements that the governments may later take up and perfect in an official manner. Mr. Ford has been a pioneer, but the pioneer days of the Pan-Pacific union are over and it is to-day one of the great organized bodies that is working for peace by understanding and an organized league of nations. Ford perhaps has not put Honolulu on the map, but he has made the "Cross Roads of the Pacific" the meeting place and forum of the peoples who must work out their destinies within its influence, and laid down for the governments of these peoples that basic political law that in time cannot be disregarded: "listen to Honolulu." Ford will pass on, but his work will live.

Lead and Zinc Mining in China

Lead and zinc are still mined by native methods in the province of Hunan, with the exception of the Shui Kou Shan Mine, which has been equipped with modern machinery under the supervision of the Hunan mining board. For the present native methods of mining suffice, as there are not enough smelters in the province to take care of the output of the mines.

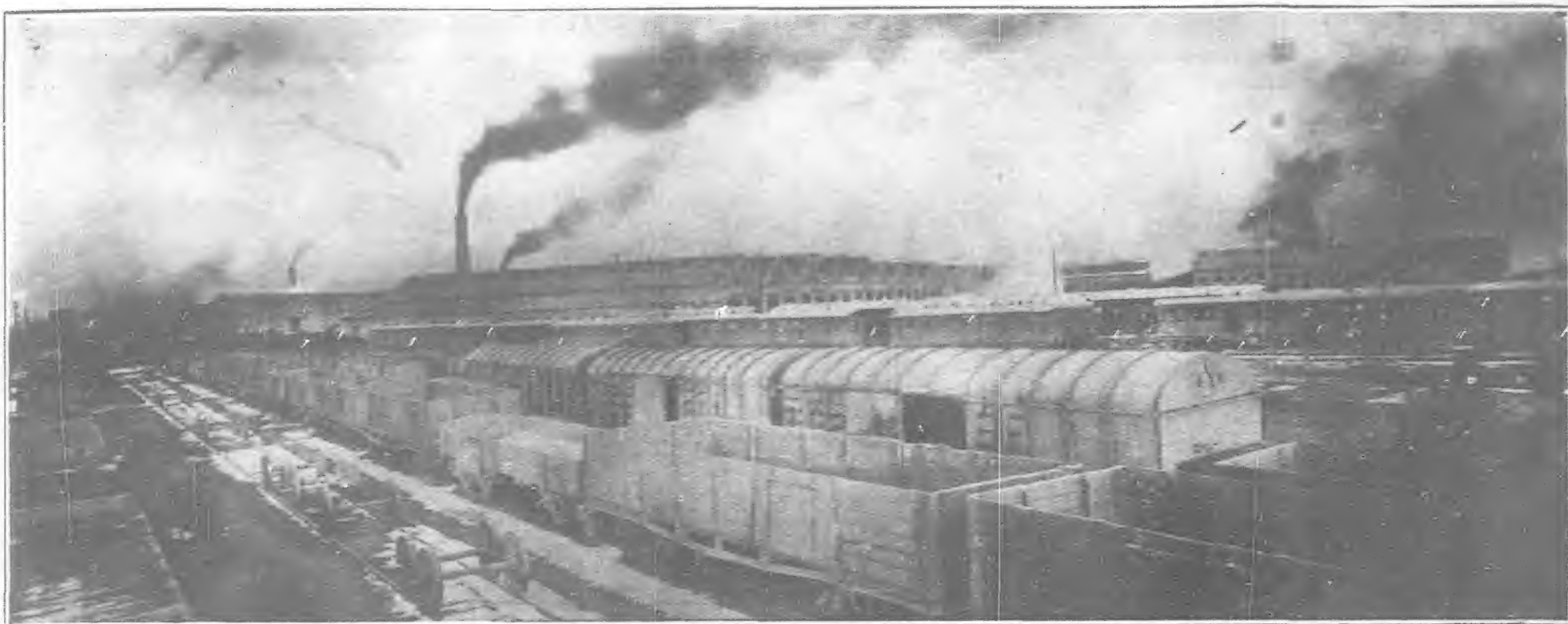
Production since 1896 has been 88,753 tons of lead ore and 236,571 tons of zinc ore, aggregating in value about \$7,000,000. Although labor is extremely cheap costs are excessive, chiefly on account of many unnecessary officials, administration comprising 36 per cent. of the total cost.

About 50 tons a day of sorted ore is the maximum future production unless development is carried ahead of stopes. With intelligent development this capacity can be doubled and the ton cost reduced. The character and size of past ore bodies leads to the belief that much additional ore exists and justifies development.

There are only two smelters in operation at this time—the Hunan Lead Smelting Works at Changsha and the Sumpeh Zinc Smelting Works at Sumpeh, which is about three miles from the Shui Kou Shan lead and zinc mines. Both plants are under the control of the Hunan board of mines, which is a government institution.

The Hunan Lead Smelting Works is a modern plant, consisting of two reverberatory roasting furnaces, one blast furnace, one refining plant, and one retorting and cupelling plant. The Parks process is used for de-silverization. On account of the high cost of fuel and repairs, the reverberatory furnaces for roasting were abandoned in 1920 and pot roasting was adopted. In the same year the blast furnace plant was enlarged by the addition of one more blast furnace. The Sumpeh Zinc Smelting Works is an old native type smelting plant. The Hunan board of mines intends to build a modern zinc-smelting plant, if the necessary funds can be secured.

About 500 tons of lead ore, composed of both lump ore and concentrates, are smelted in the Hunan Lead Smelting Works every month, producing approximately 250 tons of refined lead about 99.90 per cent. pure and 10,000 ounces of silver of 99 per cent. fineness. The refined lead is sold to the native shops and foreign firms. It is shipped to Shanghai and Hankow and occasionally exported to Japan.



View of Tangshan Works

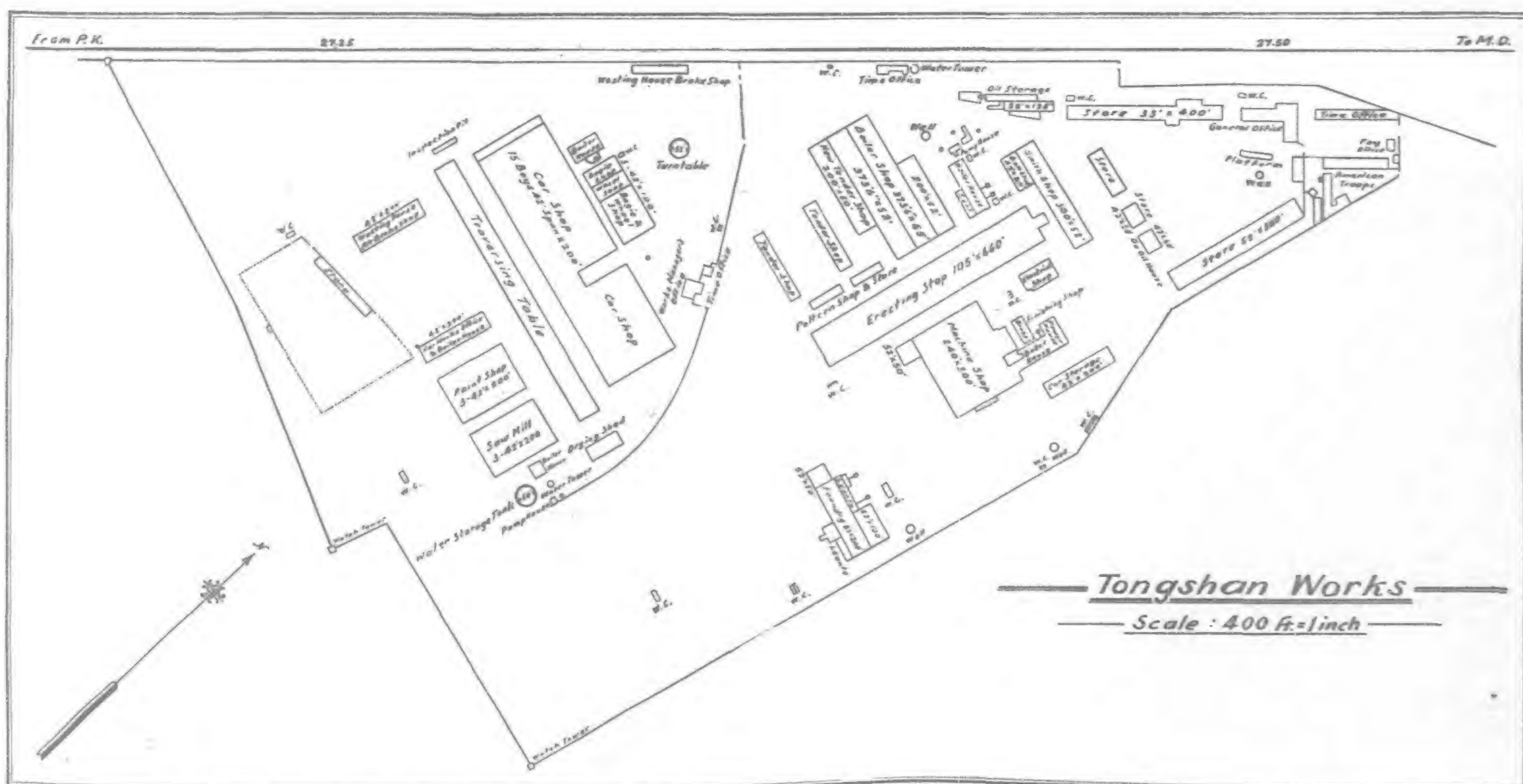
THE TANGSHAN WORKS

H. STRINGER, B.A., A.M.I.C.E.

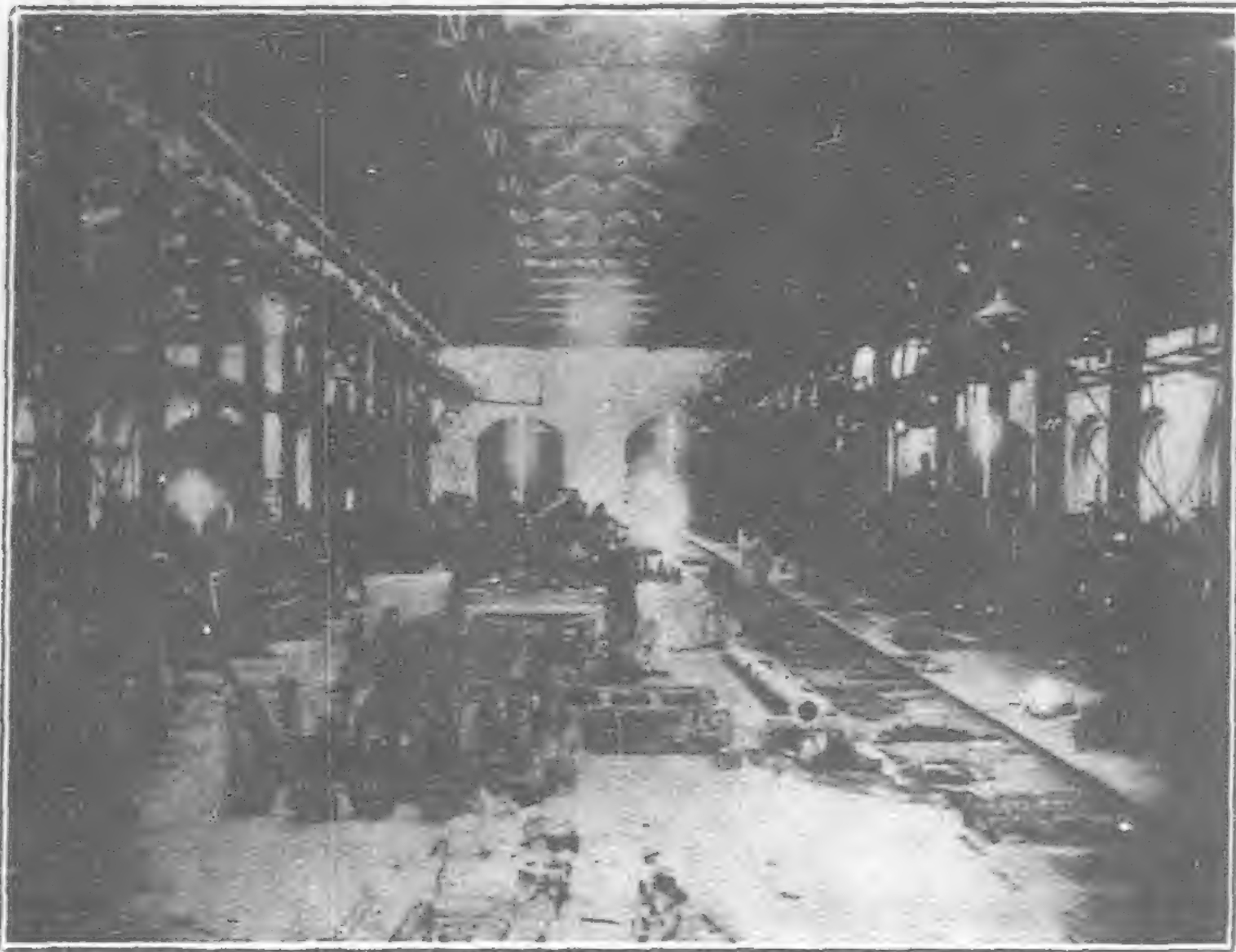
THIS is the locomotive carriage and wagon works of the Peking-Mukden Railway. The present works replaced one on a much smaller scale now utilized as repair shops by the Kailan Mining Administration. Building on the present site began in 1899 the first structures to be put in hand being the erecting, boiler and machine shops, smith's shop, stores and time office. These were completed in 1900 and by 1903 the whole works had been removed. Considerable extensions were made in 1907 more particularly to the car works and since 1915 there has been considerable building activity in all departments.

Power is derived from three main boiler houses for the locomotive and car works, and the electric power-house. The first boiler

house is equipped with two Babcock and Wilcox, five Cornish and two Lancashire boilers, the second with four Babcock boilers and the last, with eight Babcock boilers. There is also an auxiliary boiler house equipped with three Cornish boilers which supplies power to the log frame, steam-driven saw, in the saw mill, and heating to the paint shop and car works offices. The Westinghouse air-brake shop also has its own boiler power supplied from one loco. boiler at 180-lbs. per sq. inch. Steam pressures are 160-lbs. per sq. inch in the electric power-house and 100-lbs. elsewhere; all boilers are hand fired. The annual-coal consumption is some 14,800 tons about 55 per cent. of which is consumed in the five winter months from November to March when the demands for heating are heaviest. The prices paid for coal are \$3.50 for lump and \$2.50 for slack.



THE TANGSHAN WORKS



Machine Shop—Car Works



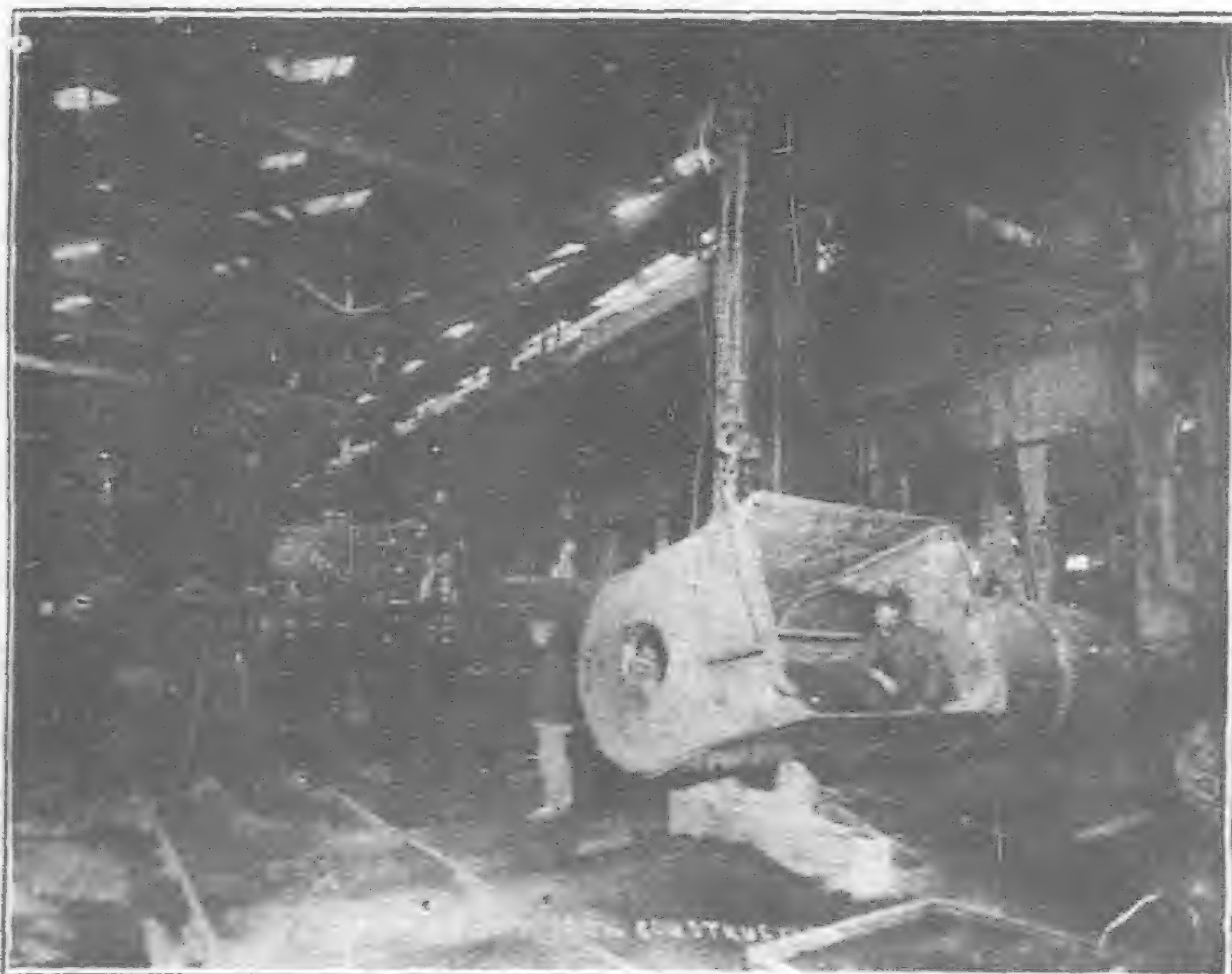
Locomotive Machine Shop



Corner of Coach Building Shop



Locomotive Erecting Shed



Boiler Shop—New Construction



Car Shop

As everywhere electricity is largely replacing steam for motive purposes. Power is supplied at present from two 110 kilowatt direct current Crompton generators, and one of 225 kilowatts of the same make, all driven by Belliss & Morcom compound high-speed vertical engines.

The pressure is 220 volts. Motors are now installed with a nominal total capacity of 1,000 B.H.P. rated continuously, and the average daily power-house output is 3,000 kilowatt hours. Power is distributed from a 22 panel switchboard also by Cromptons.

To cope with recent developments a new 500 kilowatt generator of the same make is now being installed which will give a total brake horse-power capacity in the power-house of 1,455 or 949 kilowatts. In connection with the power-house there is also a battery 118 cells with a capacity of 420 ampere-hours.

Hydraulic power at a pressure of 1,500 pounds is supplied to hydraulic rivetters and presses from an accumulator worked by three pumps. Air pressure is in universal use all over the works for drills and hammers, air at 100 pounds per sq. inch being supplied from three compressors in the car works and four in the locomotive works.

Generally speaking all the heavier machines have their own electric drive, and shafting is electrically driven in all machine shops and the saw mill. Steam is confined to the smith's shops for steam hammers, and for heating. The shop cranes of heavier capacity are all electric driven.

The water supply of the works is obtained chiefly from one 8-in. borehole of a depth of 90-ft. approximately. There are also seven surface wells from which water is pumped by steam or electrically and by compressed air wherever depth permits. The bore hole output of 8,000 gallons an hour together with that of two surface wells (operated by compressed air and giving 4,000 gallons an hour) gravitates to a reinforced concrete reservoir of 250,000 gallons capacity, whence it is electrically pumped in to a water tower of 35,000 gallons which is connected with a second tower of 35,000 gallons capacity (the water being under a mean head of 40-ft.). The average daily consumption is 160,000 gallons (winter months 200,000 gallons) of which the works itself consumes an average of 80,000 gallons the balance being used for locomotive supply, the shed tank in the station drawing from the same source.

With regard to the shops in detail, the boiler shops are in process of re-organization.

Very shortly they will be capable of dealing with 28 boilers under repair, eight boilers under construction and twelve under test and mounting. These shops are served by one 30-ton electric crane, one 15-ton electric crane and another 30-ton electric crane

is to be shortly installed. The equipment is remarkable for an Armstrong Whitworth boiler shell boring machine which will drill a fire box—900 holes in one working day against eight days required by older methods. There is also a rotary splitting shears by Ryersons of

Chicago which will shear plate up to 1½-in. thick on a 10-ft. gap. There is also a large vertical gap hydraulic rivetter for boiler rivetting fixed in a pit and served by a 20-ton crane (hand) which is also utilized for the shell boring machine previously mentioned. A hot flanging press (Twedell system) capable of flanging plate up to ¾-in. is in use for boiler shops and car requirements.

Boiler plates are shaped by a Smith vertical plate bending rolls capable of taking inch plate 12 feet long, while there is also a large Bennie plate punching machine with a capacity for 1½-in. holes in 1½-in. plate. There are two Alfred Herbert automatic stay-making machines.

Boiler tubes are scaled on withdrawal by a machine on the friction roller principle designed in the works. Ends are also cropped and safe ended by machine; and afterwards tested hydraulically up to 250-lbs. per sq. inch. A scaling machine which scales tubes by stretching by hydraulic power is also giving

good results. At present 30 new boilers are under construction.

The tender shop which adjoins these buildings is provided with eleven pits each of which will accommodate two tenders. It is served by a 30-ton electric crane and the building is of sufficient height to admit of tenders being lifted over each other to the two tracks which serve the shop.

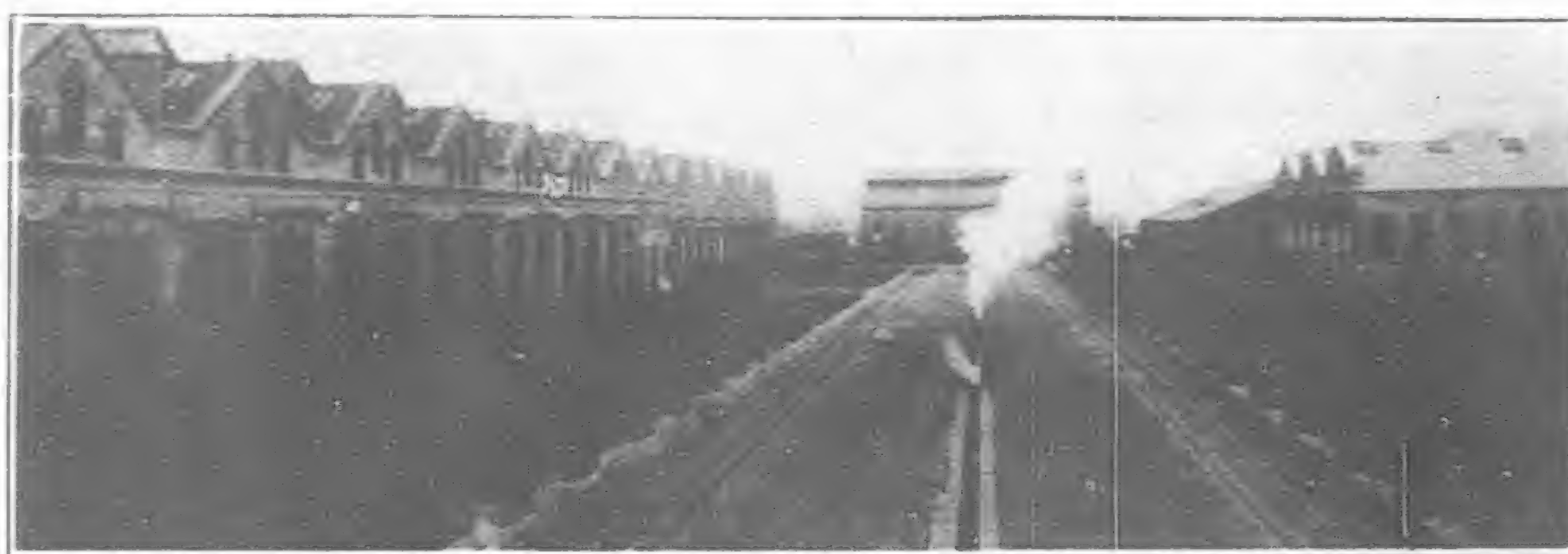
The erecting shop is furnished with longitudinal pits and is equipped with two 45-ton electric cranes together capable of handling the heaviest engine now in use.

The shop has portable self-driven machines for machining horn blocks and for re-boring cylinder barrels in position. About fifteen locomotives pass through the shop each month of which five are general overhauls.

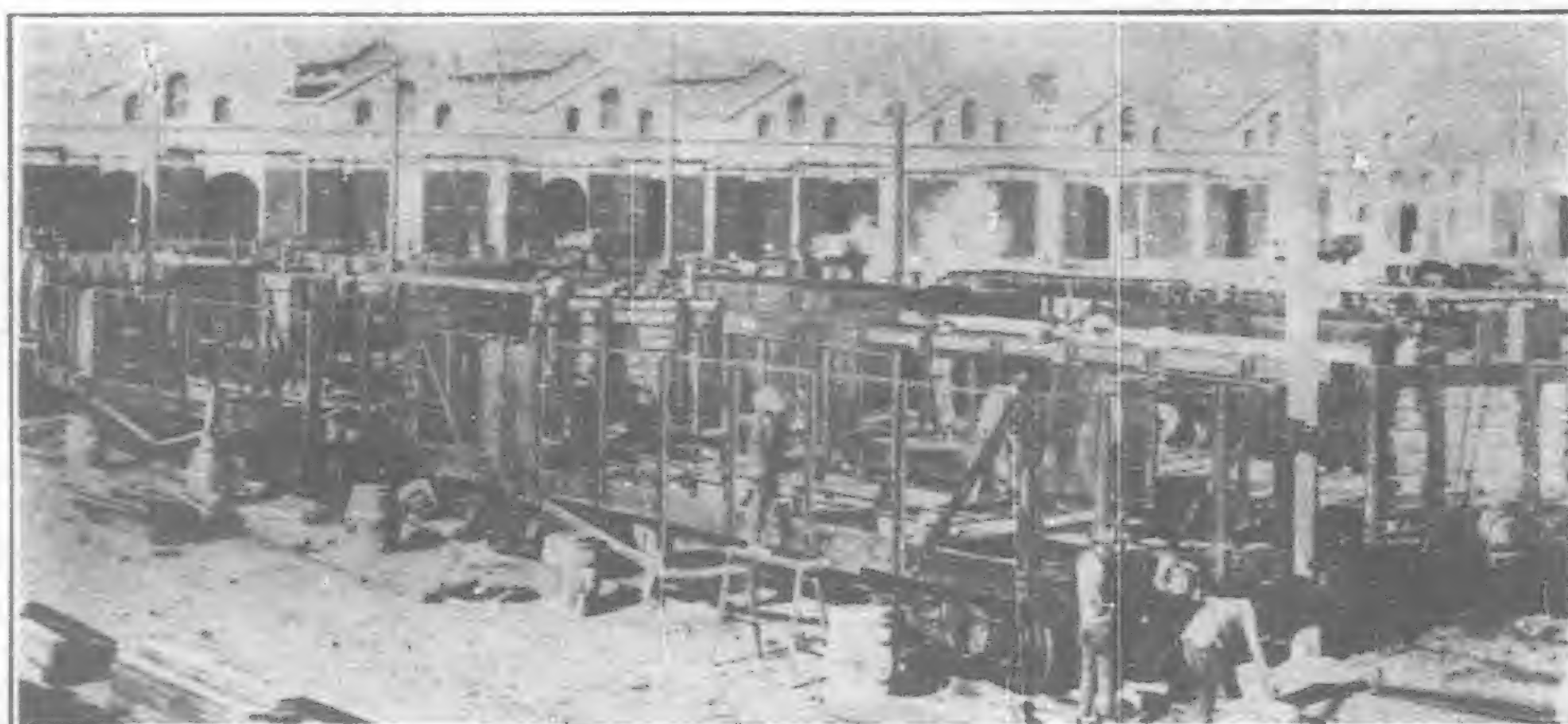
In a lean-to to this shop is the engine painting department shortly to be moved to the main paint shop the traverser for which having been recently converted to electric drive and strengthened for loads of 80 tons.



Car Works Yard



Coach and Car Shops

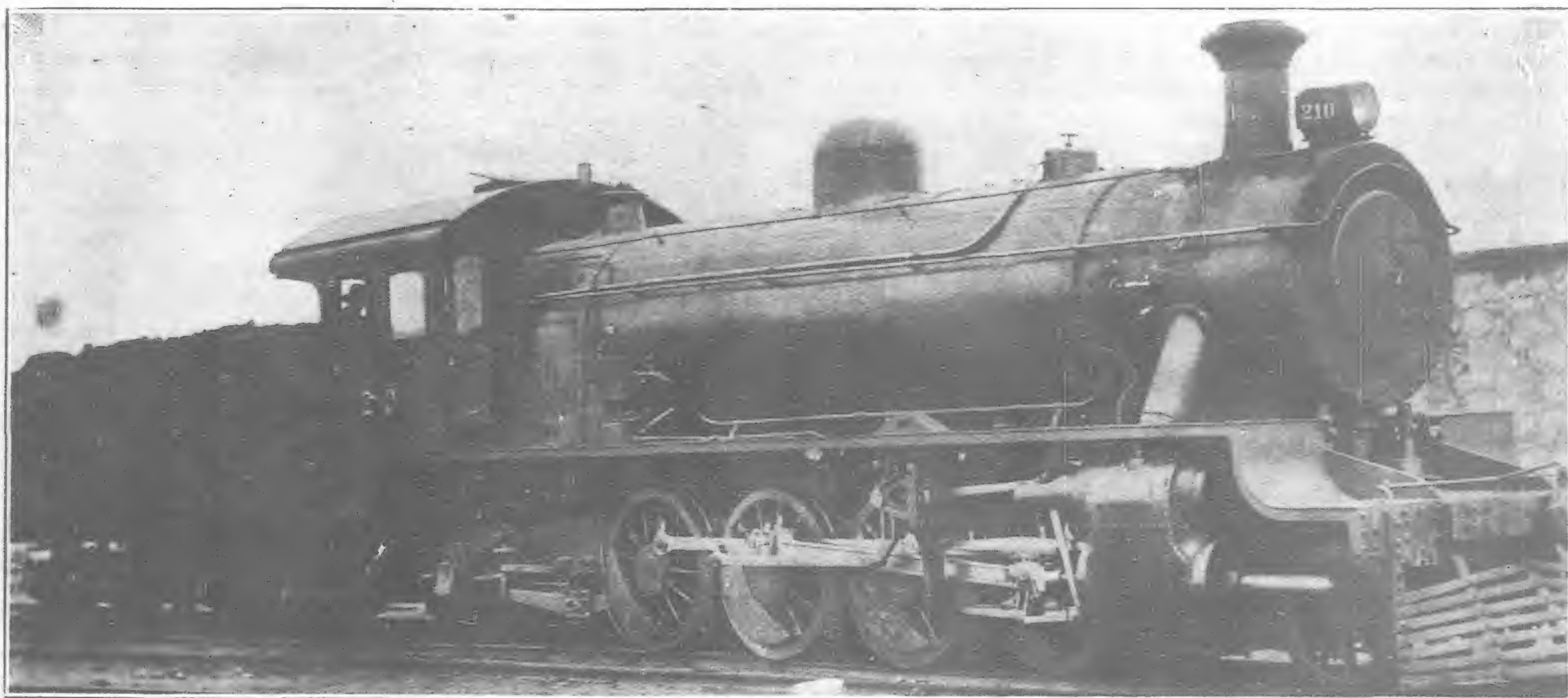


Erecting New Cars

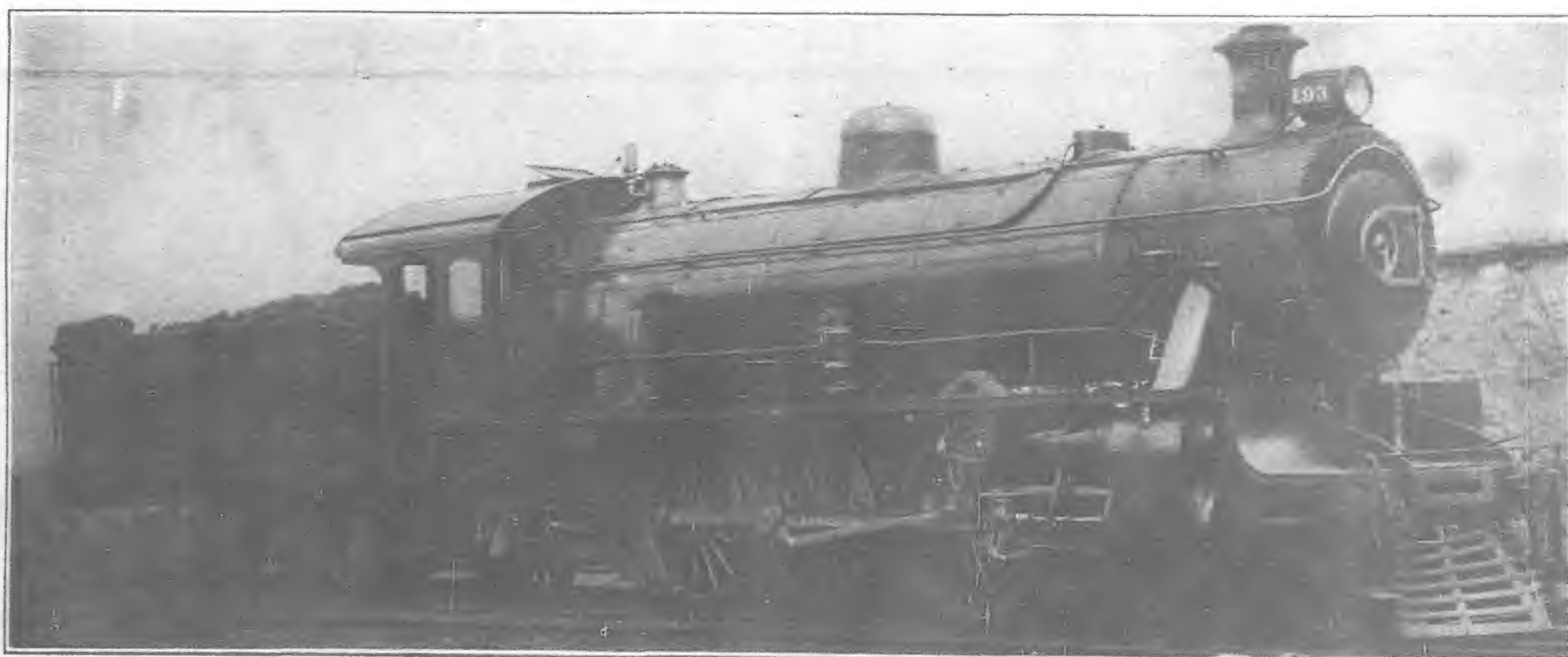
TYPES OF LOCOMOTIVES BUILT AT THE TANGSHAN SHOPS



Ten Wheeler Passenger Locomotive



Baldwin Mikado Type



Latest Pacific Type Locomotive

The machine shop equipment is mainly remarkable for a 7-foot boring mill by Cravens, a 42 inch duplex boring mill by Webster and Bennett and a London wheel lathe which will deal with 5-ft. 6-in. diameter wheels. It has the latest hydraulic equipment for removing and fixing wheels and axles, is furnished with a case hardening plant, and has oxy-acetylene and electric welding plants sufficiently portable to work in other shops if needed. The bay dealing with wheels and axles is served by a 10-ton electric crane.

Eight new locomotives are under construction the only finished material imported being wheels and axles, springs and brake equipment.

The foundry is served by a 10-ton electric crane. It is equipped with pneumatic moulding machines for repetition work and has two Morgan tilting crucibles in the brass foundry. The output is about 90 tons of iron and 16 tons of brass castings per month. This cannot keep pace with growing requirements and the foundry is in process of enlargement.

The car works has its own smithy, frame, and machine shops, and a separate department for dealing with wagon wheels and axles.

The smithy, which has 92 fires, five steam hammers and two hot saws, is mainly remarkable for a Brett three stage drop hammer battery for stampings and general smith work. The machine shop has the usual equipment including a Putnam wheel lathe which turns down seven pairs of car wheels per day at a cost of 36 cents each. The saw mill serving these shops is the most recent addition to the works. With the exception of a 60 h.p. vertical steam log saw the motive power is electric to the extent of 130 h.p. The shafting with the exception of saw sharpening tools is in pits. The machines are all of English manufacture. Timber is mainly imported in log, but two inch planks for car bottoms are also stocked. With this exception the saw mill meets all requirements as regards scantlings, mouldings, flooring, also mortising and planing, for carriage and wagon work. A drying shed with steam-drying chamber is provided for seasoning timber.

The paint shop which is steam heated and has six pits is of sufficient size to accommodate sixteen passenger cars. Repairs and painting of wagon stock are at present carried out in the open. Bogies and underframes are painted with a tar paint neutralised with cement.

The Westinghouse air-brake shop is used

for the repair and testing of this brake which is standard on the railway. In the same building is housed the electrical department which in addition to maintaining the electrical equipment of the works is responsible for the lighting of eight stations, the maintenance of train lighting sets of which there are 141 on the Stone system, and the care of fan equipment, and of those staff quarters electrically lit.

The car works is served by an electrically driven traverser taking loads up to 80 tons.

Wagon stock repairs are carried out entirely in the open,

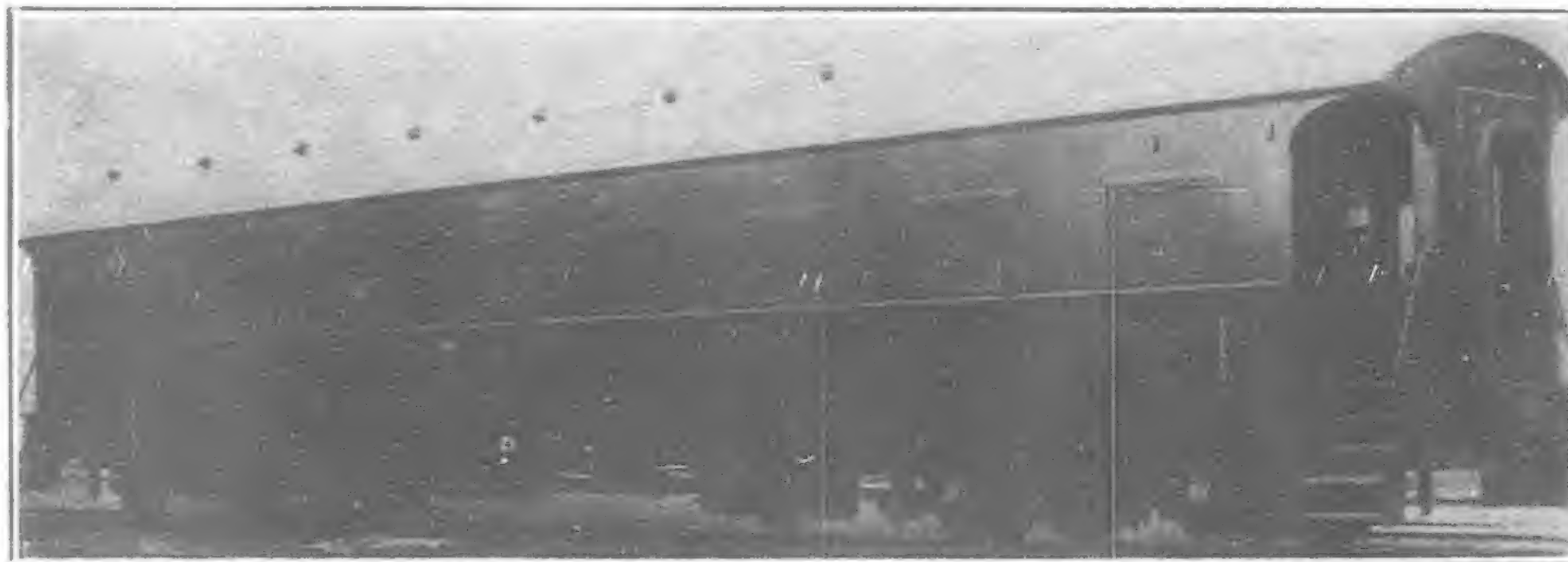
the sidings being able to deal with 300 cars per month. Sixteen passenger cars and sixteen brake vans are at present under construction. As regards passenger car construction the only finished materials imported are springs, wheels and axles, brake and electrical gear. Everything else even to nickel plating tailoring and upholstery is carried out locally. Recent additions to wagon stock include 300, 40-ton all steel coal cars and 200, 30-ton covered cars by the Metropolitan Carriage and Wagon Co. The cars are sent out knocked down and are rivetted up at the rate of sixteen a week. The works is equipped with an up-to-date tailor's shop, has three bolt and rivet making machines with a capacity of 60,000 per month, and all cotton waste from shops and car axle boxes is passed through a Tern De-Oiling plant which extracts and purifies the oil, and renders the waste fit again for shop and locomotive shed use.

This completes very summarily the detail notes of the various shops. To again generalise, the heating of the shops is either hot air on the Sturtevant principle or steam through radiators manufactured from old boiler tube.

Until within a year ago the pail system was in use for dealing with sanitation, but incinerators after a design used by the British armies in France have recently been installed for dealing with solids. These have so far worked very successfully but of course the system earns no revenue as the old one did.

Structurally great attention has been paid of late years to the elimination of fire risk. On this account second floors were provided

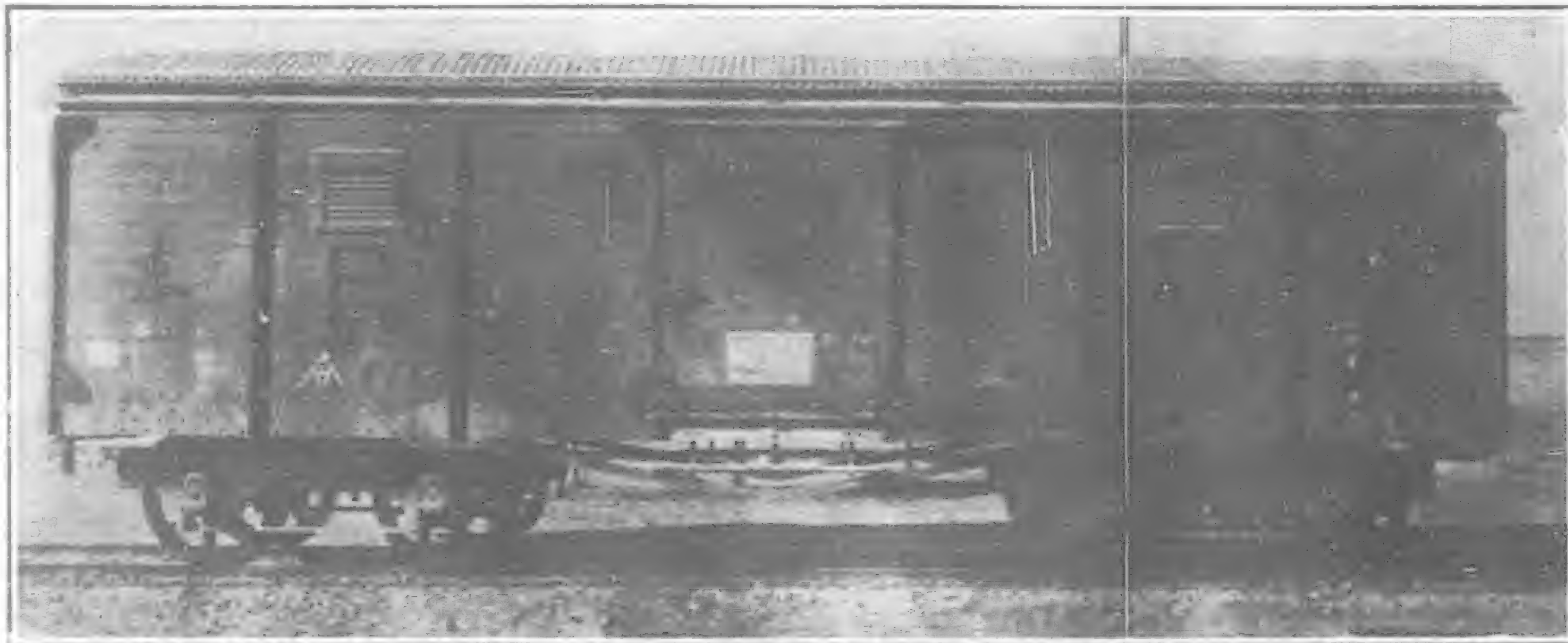
are in re-inforced concrete, windows are in cast iron or of angle iron construction, doors of steel and lintels for the same also of concrete. Buildings are carried out in the native blue brick on a rubble base wherever circumstance admit, but where work of any strength is required a hand-made fire-clay brick is used which



Buffet Car Built at the Tangshan Shops



Standard Passenger Car Truck

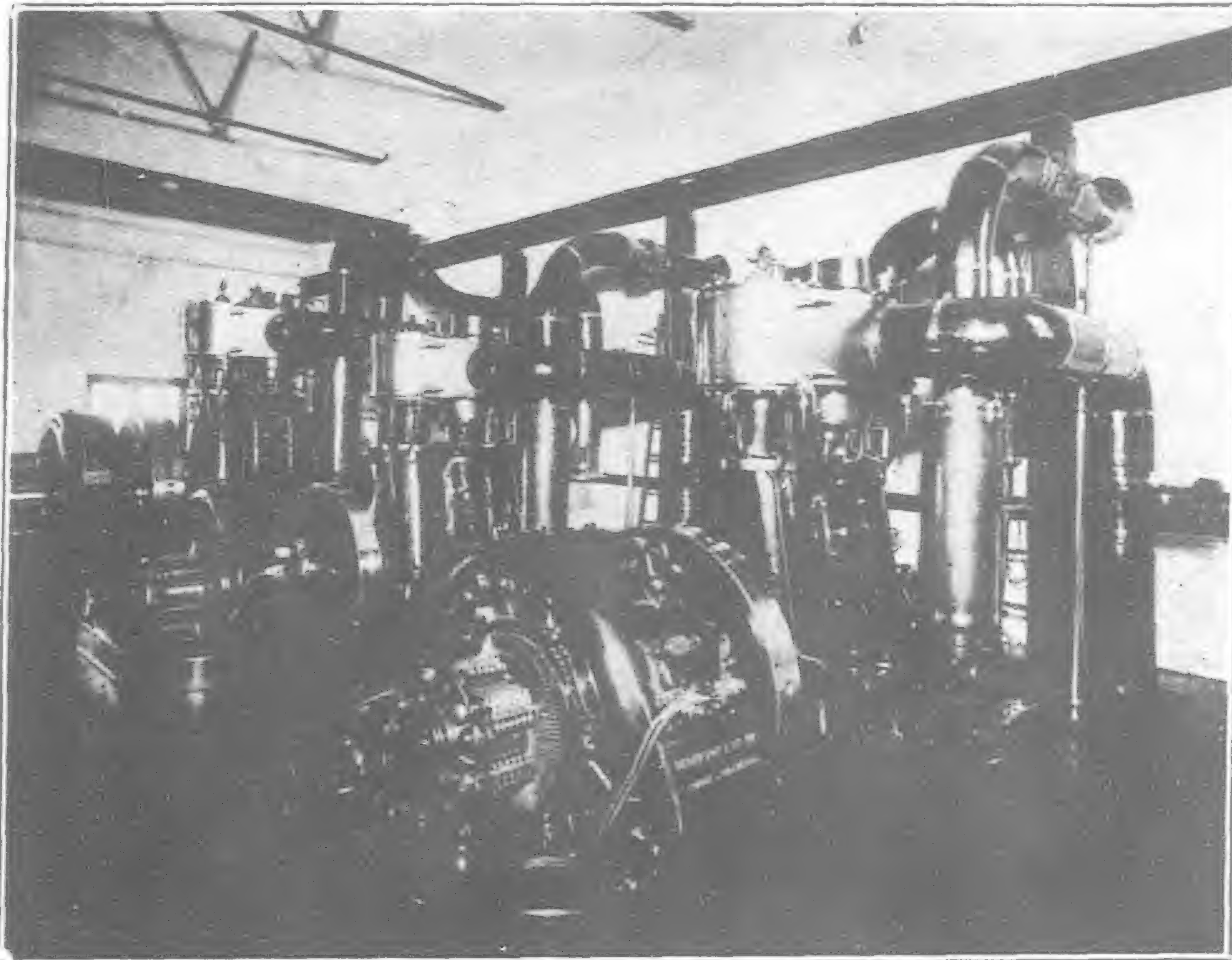


30-Ton Covered Car built at the Tangshan Works

crushes at about 1,200-lbs. per sq. inch. Floors are in concrete; wood blocks cut from old sleepers and soaked in tar have been tried for this purpose, but they are not an unqualified success being far too sensitive initially to temperature change. Roofing during the war was carried out in waterproofed felt laid in pitch on boards, and this policy may be continued in Smithies and engine sheds but even in such unsuitable localities galvanized iron has recently been removed after being in service 17 years. There is thus little question that this material will again come into favor for general roofing purposes in a climate with the extremes of North China. Roofs are all of the ordinary ridge type with about a quarter rise. Skylights on all new work are in wired glass and roof lighting is proportioned at the rate of 25 per cent. of roof area. Store racks are either in steel or in reinforced concrete on fire-brick pillars in the case of new work. Craneways are carried on arches wherever height permits.

The works has a 12-foot macadamised road running through it and the various shops are served by 13.5 miles of sidings. Main

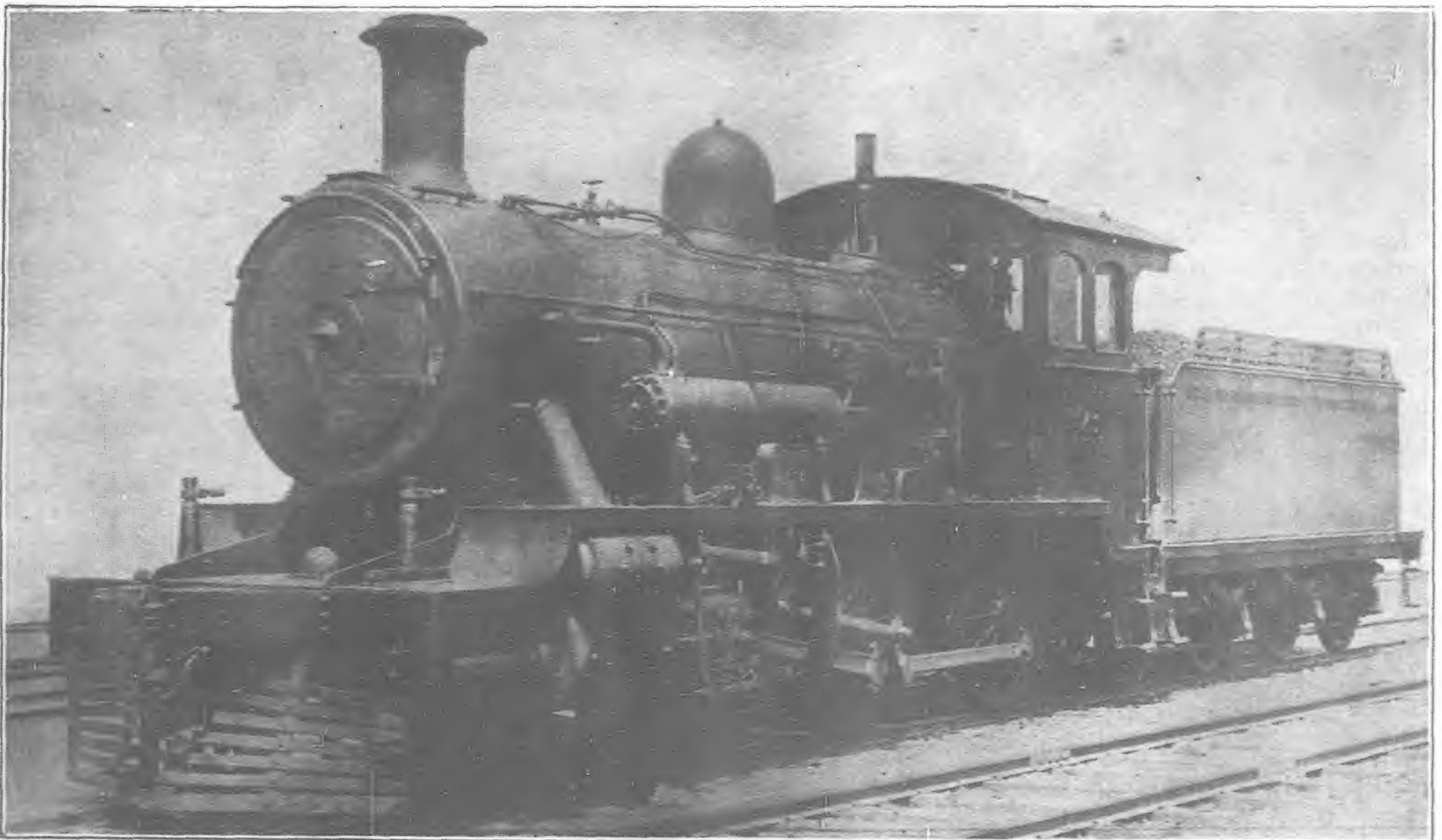
roads are all under a 60-pound rail, car repair and shop sidings have either a 45 or 50-pound rail. Where loads are light and in sidings under cover a re-inforced concrete sleeper, re-inforced with old boiler tube, is in use.



Power Plant—Tangshan Shops

As regards labor, at the present time some 3,000 men are employed. These men wherever feasible work under the Halsey bonus system based on estimates, as introduced in the Sakako Works of the South Manchuria Railway. Piece work is not usual except in cases of special urgency, the bonus system giving very satisfactory results (the average bonus earned being about 30 per cent.) The wages paid are as follows: Fitter 1.96 maximum; smith 1.86 maximum; carpenter 1.30 maximum; 0.36 to 0.48 coolie. Up to date there have been no labor troubles worthy of mention, but the politically

actuated agitator has recently appeared promising Utopias and framing exorbitant demands. They who listen and throw up their hats are at present a small minority but labor has always been ruled by articulate and noisy remnants so that the future is somewhat



Heavy Mogul Engine: First Engine Built in China fitted with Feed Water Heater and Superheater. Shows a 25 per cent. saving over sister engines not so equipped

hazy in this respect, though it is to be hoped that the innate conservatism of the Chinese may counteract this disturbing factor. Supervision of the shops is in the hands of seven British foremen.

The drawing office is divided into two departments—locomotive and tools, and cars and is in charge of a European chief draughtsman who controls 30 Chinese draughtsmen. It is equipped with the necessary valve gear and other models, and has a Photostat apparatus for rapid printing and plain reduction. Any tests carried out are supervised by this department, there being a 30-ton Buckton testing machine for tensile and bending tests, and a drop testing machine for axles with a 1-ton tup, and a maximum fall of 40 feet.

I am greatly indebted to Mr. F. A. Jamieson, locomotive and works superintendent, and Mr. F. Sugden, works manager, for much information which is embodied in this article, and I have also to thank Mr. L. J. Newmarch, the engineer-in-chief and general manager, of the Peking-Mukden Railway, for permission to make use of this information.

New Tendency in Japan's Silk Spinning Industry

AT the time of the panic in 1920, the silk spinning industry was the hardest hit of all Japanese industries. Not only newly established companies were ruined but such old concerns as the Fuji Gas Spinning Co., Ltd., and the Kanegafuchi Cotton Spinning Co., Ltd., incurred great losses on their silk business, at the same time their cotton spinning business was going from bad to worse.

Towards the end of 1921, the industry took a favorable turn, and the end of the year was prosperous. Prices rose abruptly, and many of the new companies such as the Japan Silk and Wool Spinning Co., Ltd., were able to clear losses and this company was even able to pay a ten per cent. dividend for the term. With the new concerns making such profits, it is natural that the old companies with excellent equipment, and comparatively low fixed capital should have made greater profits. Kanegafuchi Spinning is said to have made a net profit of Y.3,600,000 on its silk spinning alone during the latter half of 1921. This is the company which pays 70 per cent. dividends on its paid-up capital, and whose shares are quoted at six to seven times their par value. One-fourth of the investment of the Fuji Gas Spinning is in silk spinning, so it can readily be seen that its business results the second half of 1921 must have shown a decided improvement over the other terms passed since the panic.

Improvement during the second half of 1921 has not held into 1922. Market quotations steadily declined, and raw materials have been ruling at comparatively high prices. Profit this year have varied from Y.39 to Y.52 per 10 *kwan* (82.8-lbs.), and compared to other lines of industry the silk spinning industry is in a very advantageous position.

The latest tendency in the industry is one of much interest. Spun silk yarn which used to be exported is now woven before it is sent abroad. This tendency is growing more and more marked. The cloth woven from spun silk yarn is called "Fuji Ginu"—"Fuji Silk," not after the mountain of that name, but after the Fuji Gas Spinning Co., which was the first weaver of this kind of silk material:—

The following table compares exports of spun silk, waste silk thread, and Fuji Ginu (Fuji Silk) during the first seven months of the past three years:—

(000 omitted)				
Kind	1920	1921	1922	
Waste Silk Yarn:				
Quantity	38,155 pieces	21,621	39,353	
Value	Y.15,061	Y. 3,386	Y. 6,232	

Kind	1920	1921	1922	
Spunk Silk:				
Quantity	2,952 pieces	1,576	1,396	
Value	Y. 2,371	Y. 1,785	Y. 700	
Fuji Silk:				
Quantity	—	15,498 yards	16,055	
Value	—	Y.12,854	Y.17,088	
Floss Silk, Mawata:				
Quantity	6,987 pieces	587	1,217	
Value	Y. 6,638	Y. 327	Y. 557	

Exports of spun silk have greatly decreased. Exports of Fuji silk, which were not itemized in the monthly report of the Customs bureau until 1921, have increased both in quantity and value. This is a sufficient sign that Japanese export trade is showing a change from the report of raw silk to that of silk textiles.

Fuji silk is manufactured to-day not only by the Fuji Gas Spinning Co., Ltd., but by the Japan Silk Textile Co., Ltd., the Kanegafuchi Cotton Spinning Co., Ltd., and various mills in the Isezaki, Hamamatsu, Gifu and Daishoji districts, all silk weaving centres. Inactivity in the export of Habutae turned the attention of weavers to the production of Fuji silk. The monthly output of Fuji silk to-day reached 40,000 pieces, and the activity of this class of weave has stimulated the whole silk weaving industry of Japan.

In weaving Fuji silk, British No. 135 yarn is used for the warp, and No. 65 for the weft. About 400 *momme* of No. 135, and 320 *momme* of No. 65, make 50 yards, one piece of Fuji silk. At current costs, with wages at 7 to 8 yen a piece, the cost per yard works out at about Y.1.16 to Y.1.17. Current market prices are from Y.1.18 to Y.1.20 a yard, leaving from 2 to 4 sen a yard profit, about Y.1 to Y.2 per piece. This is the reason why the old producers of *habutae* and other silk textiles for export have been tempted to manufacture Fuji silk.

Before the war there were only 106,500 spindles in the silk industry in Japan; now there are 187,700 owned by 18 companies. Plans for expansion now under construction will add 96,000 spindles to present equipments, making the total 283,700 spindles. The following table showing the plans for each of these 18 companies for expansion will indicate how the silk spinning industry is keeping its place in the textile industry of Japan.

(In this table "mules" are estimated in their efficiency as "spindles.")

Companies	Present equipment spindles.	Plans for extension spindles.	Total spindles
Kanegafuchi Boseki K. K. ..	60,078	—	60,078
Fuji Gas Spinning	62,042	15,600	77,642
Nihon Silk & Wool Spinning ..	20,000	16,460	36,460
Nihon Silk Weaving	7,500	7,500	15,000
Nihon Silk & Cotton Weaving ..	5,400	3,540	8,940
Nihon Penni	3,000	15,000	18,000
Joshu Raw Silk	840	3,600	4,440
Taihei Cotton Spinning	920	1,080	2,000
Fukushima Cotton Spinning ..	—	3,000	3,000
Toyo Raw Silk	2,400	2,016	4,416
Katagura Gumi Raw Silk	4,000	—	4,000
Koriyama Cotton spinning	5,640	—	5,640
Shinano Raw Silk	3,840	—	3,840
Tokyo Mousseline	3,000	7,200	10,200
Toyo Cotton Spinning	3,600	16,000	19,600
Nihon Silk Spinning	1,500	—	1,500
Nakatsu Raw Silk	—	5,000	5,000
Omi Raw Silk	4,000	—	4,000
Total	187,760	95,996	283,756

Railway Bearings

By H. J. Moysey

THE question of using ball and roller bearings in railway rolling stock is at the present time being very much discussed both in technical and commercial circles; not because their use is a new idea which has occurred to some engineer in a moment of inspiration; but because those who have been working on this proposition have, after many years of careful and exhaustive testing, at last arrived at

ly reliable data to warrant the enormous outlay involved in making such a radical change in accepted design.

The ultimate object to be attained is, of course, increased economy of working, but as that involves not only the saving of power but questions of the cost of renewals and upkeep generally, it was essential to thoroughly study the question of durability before bringing the proposal forward as a practical proposition for general adoption.

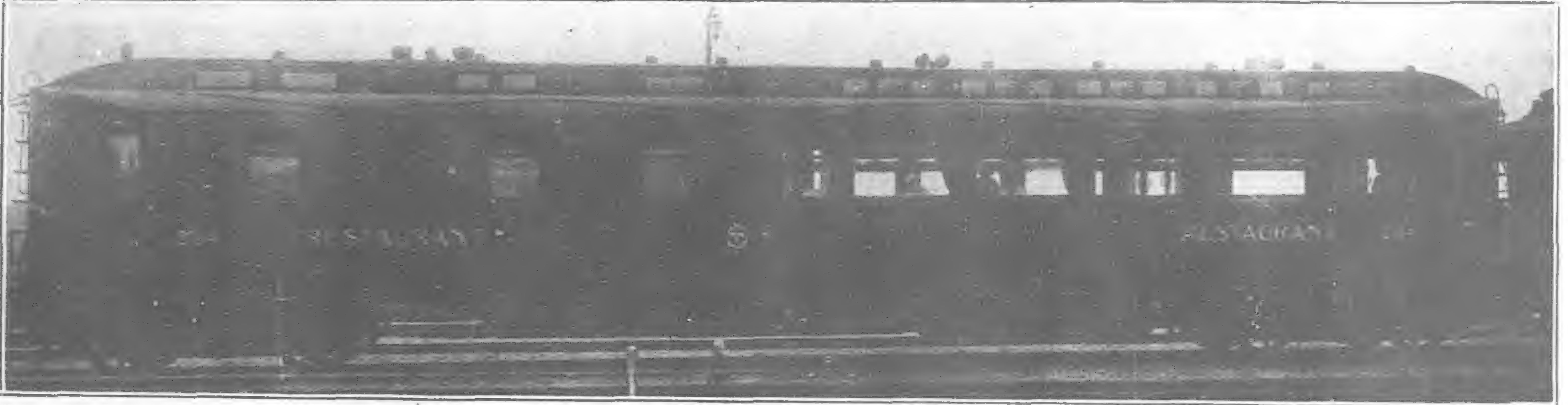


Fig. 1. Restaurant Carriage on SKF Ball Bearings for the Swedish State Railways.

results which may be fairly considered as a practical solution of the many difficulties which have hitherto barred the way to the general adoption of such bearings, and it may therefore be of interest to review briefly what has been done in this direction.

The work has been carried on quietly until, now that some practical results have been obtained, a number of railways in various countries are beginning to make tests on their own lines to satisfy themselves that the results claimed can be obtained also by them; and this extended activity has attracted the attention, not only of engineers but also of commercial men who have taken it up as a new idea because now at last those who have been quietly testing it are sufficiently satisfied to bring it forward with confidence of success.

It is now a number of years since preliminary experiments gave sufficiently attractive results to induce a number of enterprising people to devote a lot of time and money to the carrying out of experiments on a scale that would provide sufficient-

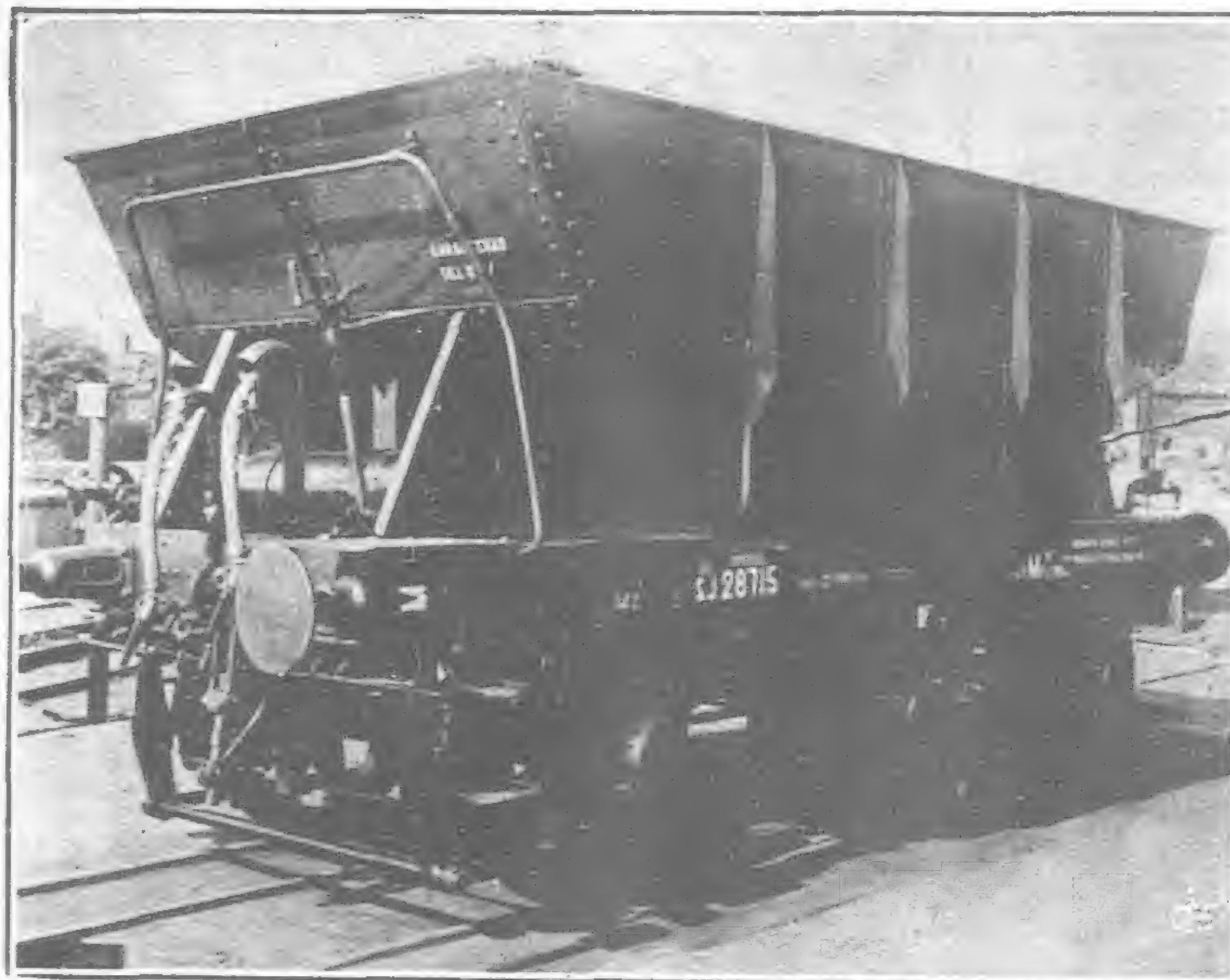


Fig. 2. Ore Wagon on SKF Ball Bearings for the Swedish State Railways.

It was this question of durability which has kept the matter in abeyance for so many years.

A number of more or less isolated tests were made from time to time with roller bearings with long rollers; but these gave trouble on account of the rollers tending to get out of place and nothing very practical was attained until the Swedish State Railway took the matter up in 1913 by commencing a number of tests which have been carried on ever since.

The result of these tests with ball and roller bearing has made it clear that the economy in power, lubrication, attention, etc., makes it desirable to change

over to such bearings as extensively as possible; but in order to attain sufficient durability it has been necessary to depart from the original design of bearing used and adopt the later design of roller bearing which is now being extensively installed by them.

It was this characteristic of strength and durability which has been difficult to obtain in practice, and which has been reached only after long and expensive work.

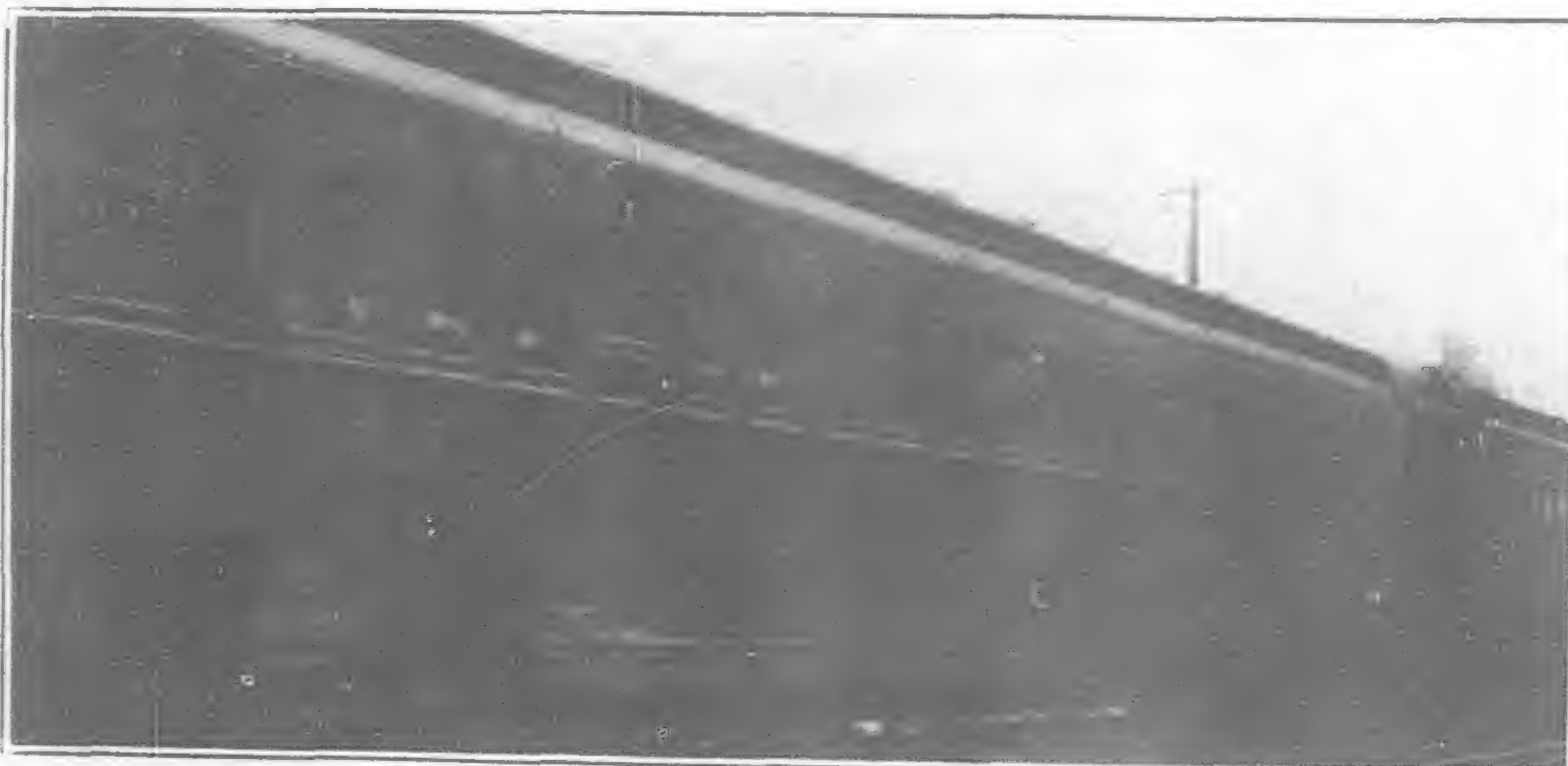


Fig. 4. Passenger Carriage on SKF Roller Bearings for an Important American Railway

In order to trace the development which has now resulted in the SKF new roller bearing construction for railway cars, a record is given below of the principal durability tests which have been carried out with SKF bearings, and which are the most extensive ones which have ever been made.

These tests were made :

In Sweden : on the State Railway and on the Bergslagens Railways.

In Denmark : on the State Railways.

In U.S.A. : on one of the most important trunk lines.

The rolling stock involved in these tests included the following :

On the Swedish State Railways 44 axles with SKF ball bearings on 11 four-axle bogie cars (Fig. 1), during a period of seven years ; 150 axles with SKF ball bearings on 50 three-axle ore wagons (Fig. 2), during a period of five years, 33 axles with SKF roller bearings in four-axle bogie cars (Fig. 3), during one year.

On the Bergslagens Railway 12 axles with SKF ball bearings on 3 four-axle bogie cars, during four years.

On the Danish State Railway 4 axles with SKF ball bearings on 3 two-axle passenger free-flexible-axle cars, during three years.

On an important railway in the United States, 26 axles with SKF roller bearings on four-axle bogie cars (Fig. 4), during one year.

cases only parts of bearings have been rejected the figures in the table state the values of the rejected parts as a percentage of the whole value of the total number of bearings in service on their respective sections.

REJECTED BALL BEARINGS IN RAILWAY CARS.

Year of service	Bogie cars on Swedish State Railways.	Ore Wagons on Swedish State Railways.	Bogie cars on Bergslagens Railways.	Free-Flexible-axled cars on Danish State Railways.
	%	%	%	%
1st	.. 16	0.55	12	0
2nd	.. 18	„	1.5	0
3rd	.. 24	„	12	0
4th	.. 10	„	7	0
5th	.. 6	„		6.2
6th	.. 2			0
7th	.. 10			0
8th	.. 10			0
Total	.. 86	2.75	32.5	6.2
Average	.. 12.3	0.55	8.1	0.8

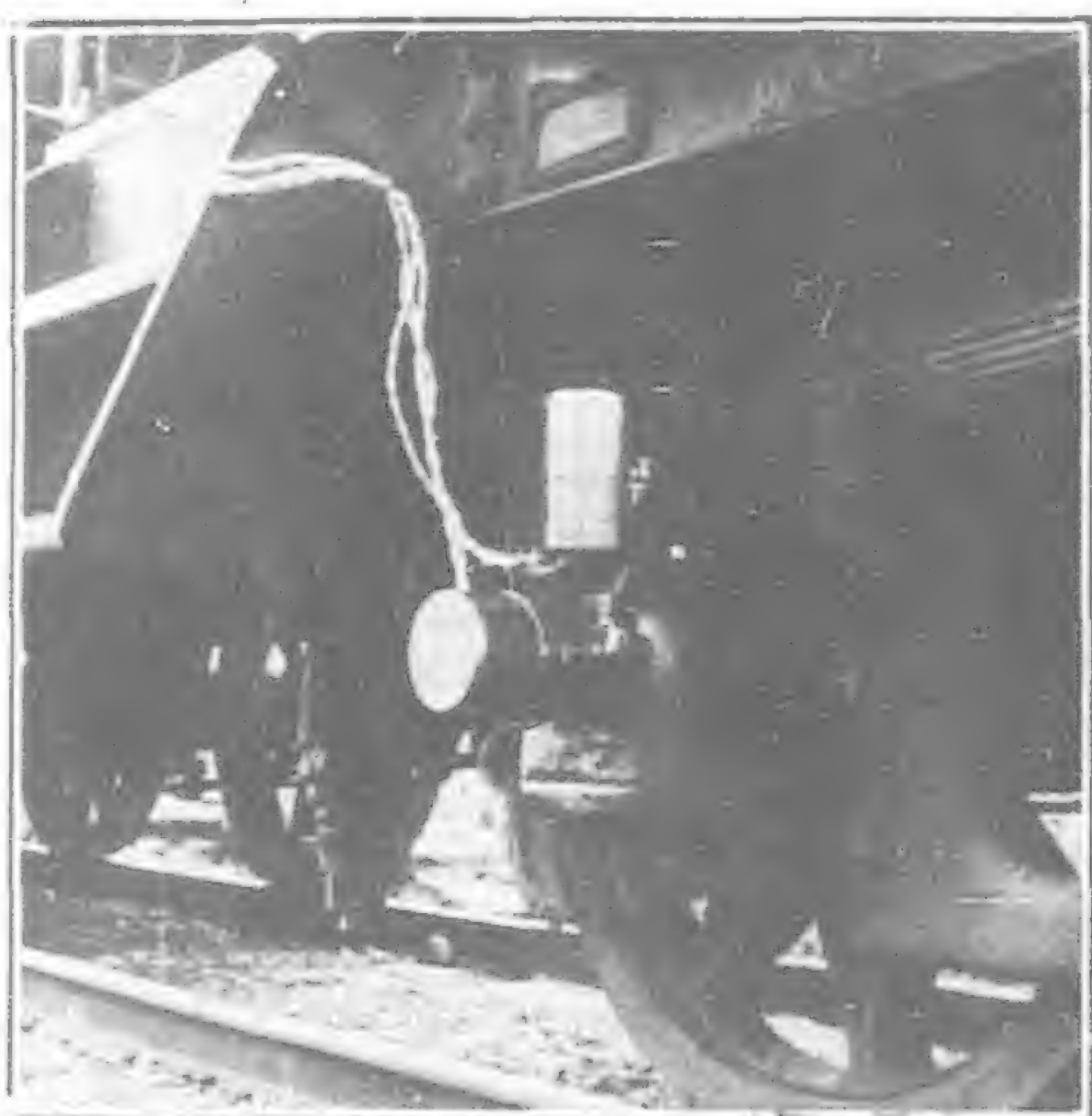


Fig. 5. Ball Bearing Box for the Swedish State Railways, Bogie Car 1913.

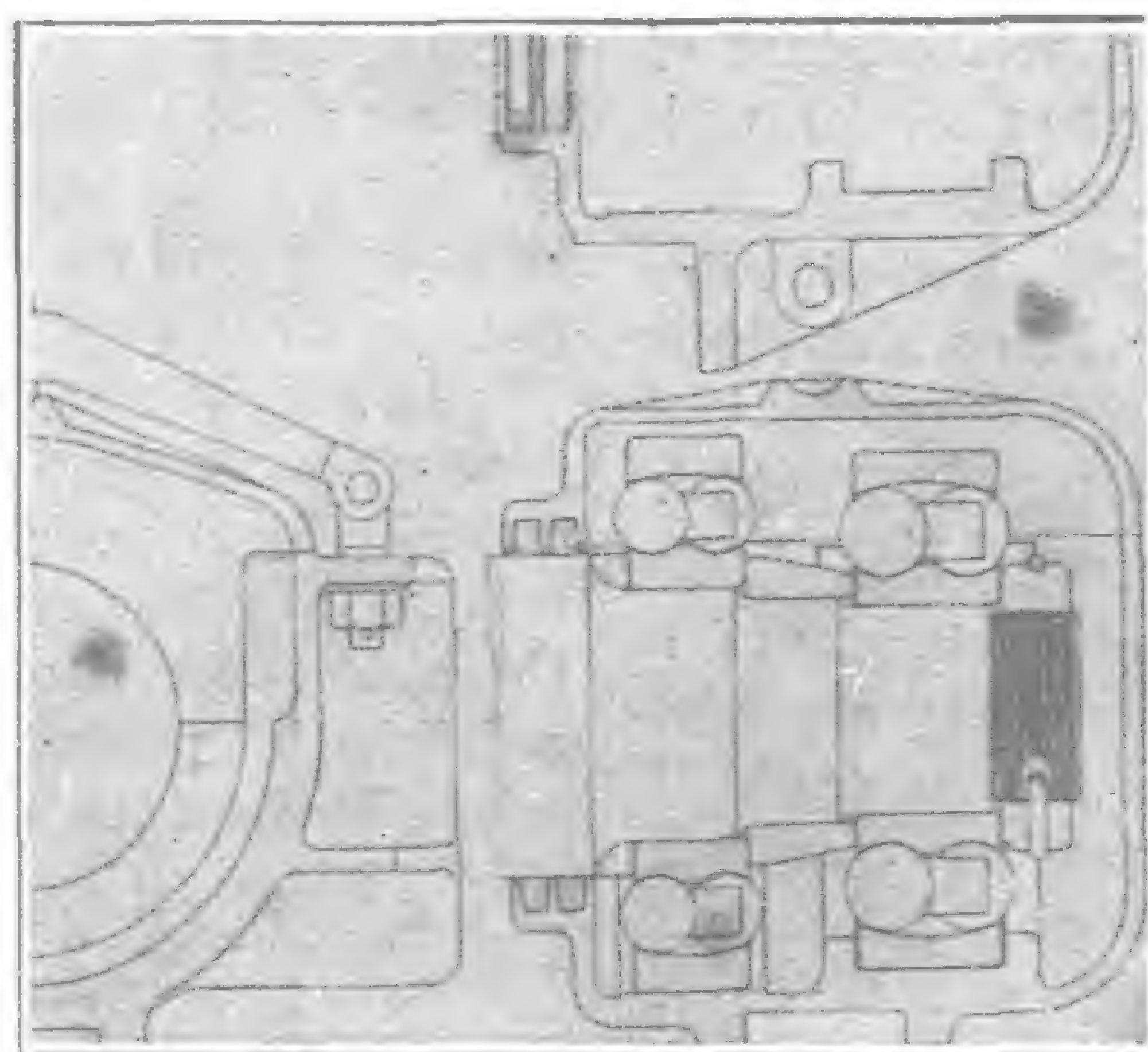


Fig. 6. Apparatus for registering shock loads in railway boxes.

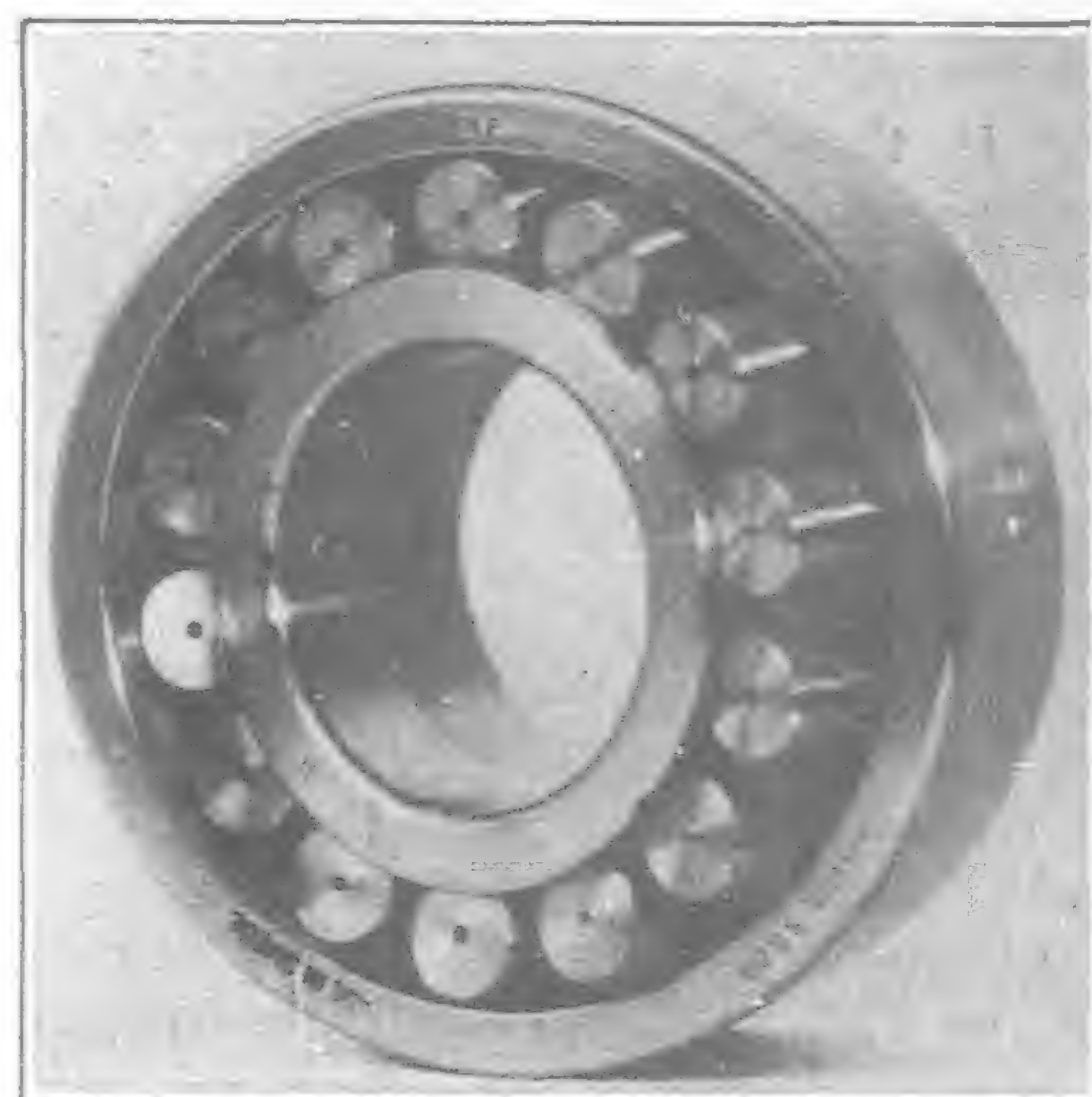


Fig. 7. Spherical SKF Roller Bearing.

The SKF ball bearing design which has been used for the bogie cars on the Swedish State Railways (Fig. 1), containing one spherical ball bearing, type No. 1418, and one No. 1322 in each box, (Fig. 5), was originally intended for lighter cars of this kind with a journal load of $4\frac{1}{2}$ tons ; but the royal board of railway directors decided to use these bearings for sleeping cars, baggage cars and dining cars in express train service, where the journal load amounts to $5\frac{1}{2}$ tons. With this increased load it was reasonable to suppose that the life of the bearings would be reduced below what it would have been had they been used for their original purposes ; but as the first tests showed good results, the greater load was considered permissible. The maximum speed at which these are run is 55 miles per hour.

In the case of the ore wagons each axle box contains one spherical ball bearing, type No. 1420, and one No. 1324, the journal load being $7\frac{1}{2}$ tons and the highest speed 37 miles per hour.

The cars on the Bergslagens Railway are equipped with the same bearings as the bogie cars on the Swedish State Railways but in this case the journal load is only about $4\frac{1}{2}$ tons.

The free flexible-axle cars on the Danish State Railways are equipped with axle boxes each containing one spherical ball bearing, type No. 1419, and one No. 1321 and in this case the journal load is five tons.

The following table gives a comparison of the numbers of bearings, or parts of bearings, that have been rejected from service on the above-mentioned railways during these tests. As in some

The annual rejections in bogie cars shown in the above table of from 8 per cent. to 12 per cent. must be considered as unsatisfactory ; but on the other hand the results obtained in the ore wagons and the cars on the Danish State Railways are rather good.

It is very important to note that none of the defects enumerated above have been of such a nature as to interfere in the least with the traffic, it having been possible in every case to run the cars on until convenient to inspect the bearings at the sheds in the ordinary way. This proves conclusively that this class of bearing is safer than the ordinary type of plain bearing, and the question resolves itself therefore into one entirely of cost of upkeep ; but as that is a point of vital importance SKF commenced an extensive investigation and experimental work in order to produce a type of bearing that would give greater durability under the conditions met with in the rapid traffic in which these bogie cars are being run.

In order to get reliable data regarding the loads arising in railway bearings under different conditions, which loads consist of static loads and shock forces in radial as well as axial direction, the shocks met with were first experimentally determined with the aid of specially constructed apparatus as shown in Fig. 6.

These measurements showed that the shocks are of such a magnitude in relation to the static journal load that they could not be satisfactorily carried by ball bearings of dimensions permitted by the limited space available in the existing railway rolling stock.

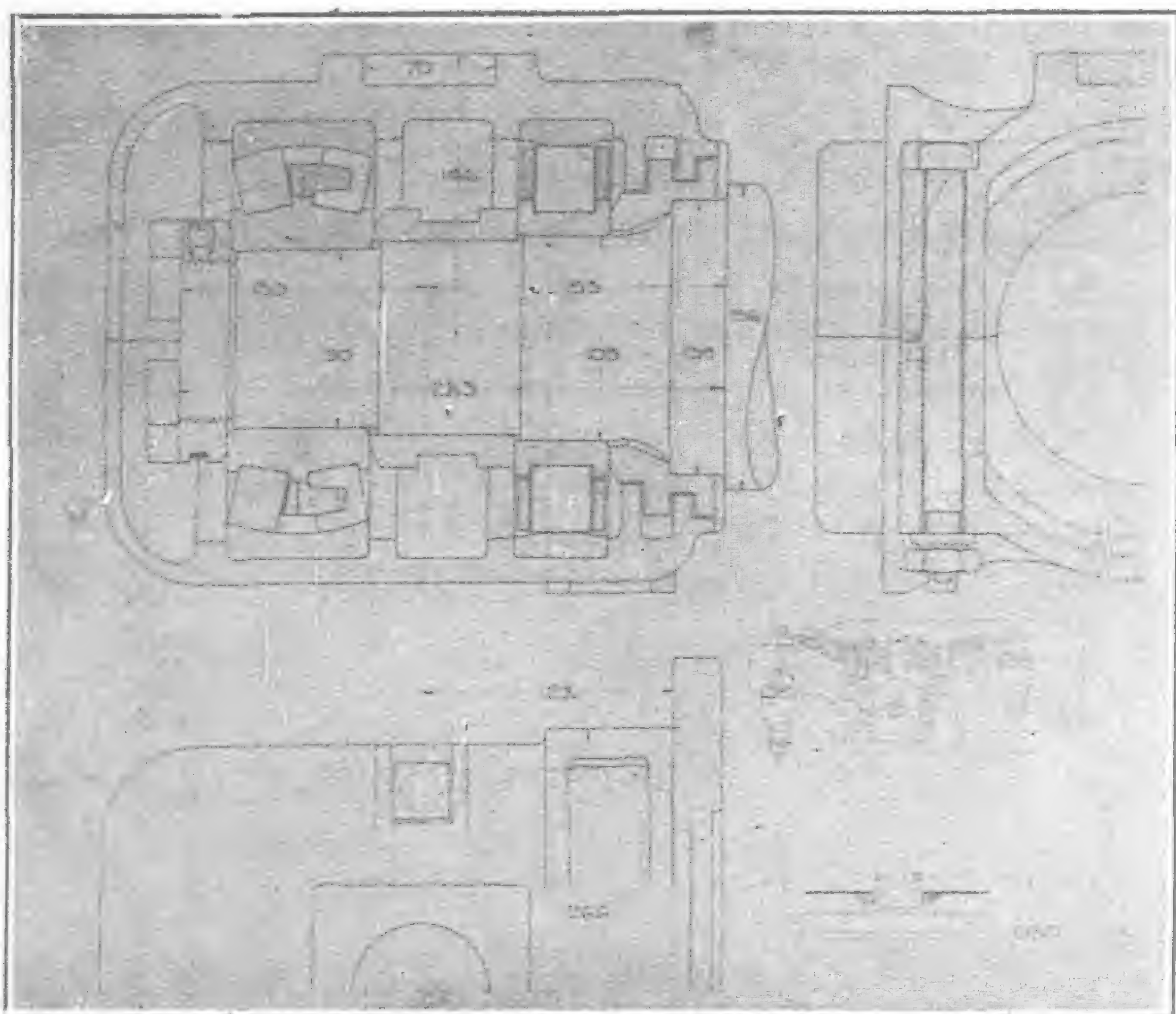


Fig. 8. SKF Railway Box with Roller Bearings for the Swedish State Railways.

It, therefore, became necessary to design a suitable type of roller bearing that would combine a low co-efficient of friction with the required degree of durability.

As a result of many experiments the SKF spherical roller bearing of the type shown in Fig. 7 was adopted, it being found that these bearings possess about double the carrying capacity of a ball bearing of the same dimensions, or a life about ten times as long for the same load.

On account of the hopes thus entertained of having found a fully suitable railway bearing, the royal board of railway directors of the Swedish Government Railways decided in 1921 to equip 32 axles for bogie cars with them and carry out a new series of tests in order to determine the durability of the new bearing design.

The new design of axle box is shown in Fig. 8 from which it will be seen that each box contains one spherical roller bearing type No. 23418 and one cylindrical roller bearing No. 8321.

The cylindrical bearing takes up only radial load, whereas the spherical bearing takes the entire thrust load in addition to its share of the radial load. The tests with these axle boxes were commenced during the latter part of the year 1921 and after practically a year have only developed one small fault in one of the cylindrical bearings, representing a yearly percentage of rejection of only 0.54 per cent.

As a result of the above the Swedish State Railways have now ordered axle boxes of the above described design for 170 bogie cars, including 1,360 axle boxes with 2,720 roller bearings; which means that the greater part of the State Railway's modern cars for express train service will be equipped with these SKF roller bearings.

This, of course, means that the authorities of the Swedish State Railways consider the present design of axle box a satisfactory solution of the railway bearing question.

The tests being carried out in America have been in progress since November 1921. The cars run with a maximum speed of 74 miles per hour and an axle load of 15 tons so that this test must be considered the most severe of any hitherto carried out.

In July 1922 these cars had covered a distance of from 68,000 to 74,000 miles, and repeated inspections of the bearing had shown that they had operated in a perfectly satisfactory manner without being in any way injured. The axle boxes used by this railway are somewhat different to the ones described above and are shown in Fig. 9 from which it will be seen that each box contains only one SKF spherical roller bearing of type No. 22332 specially applied, and this bearing has to take the loads in all directions.

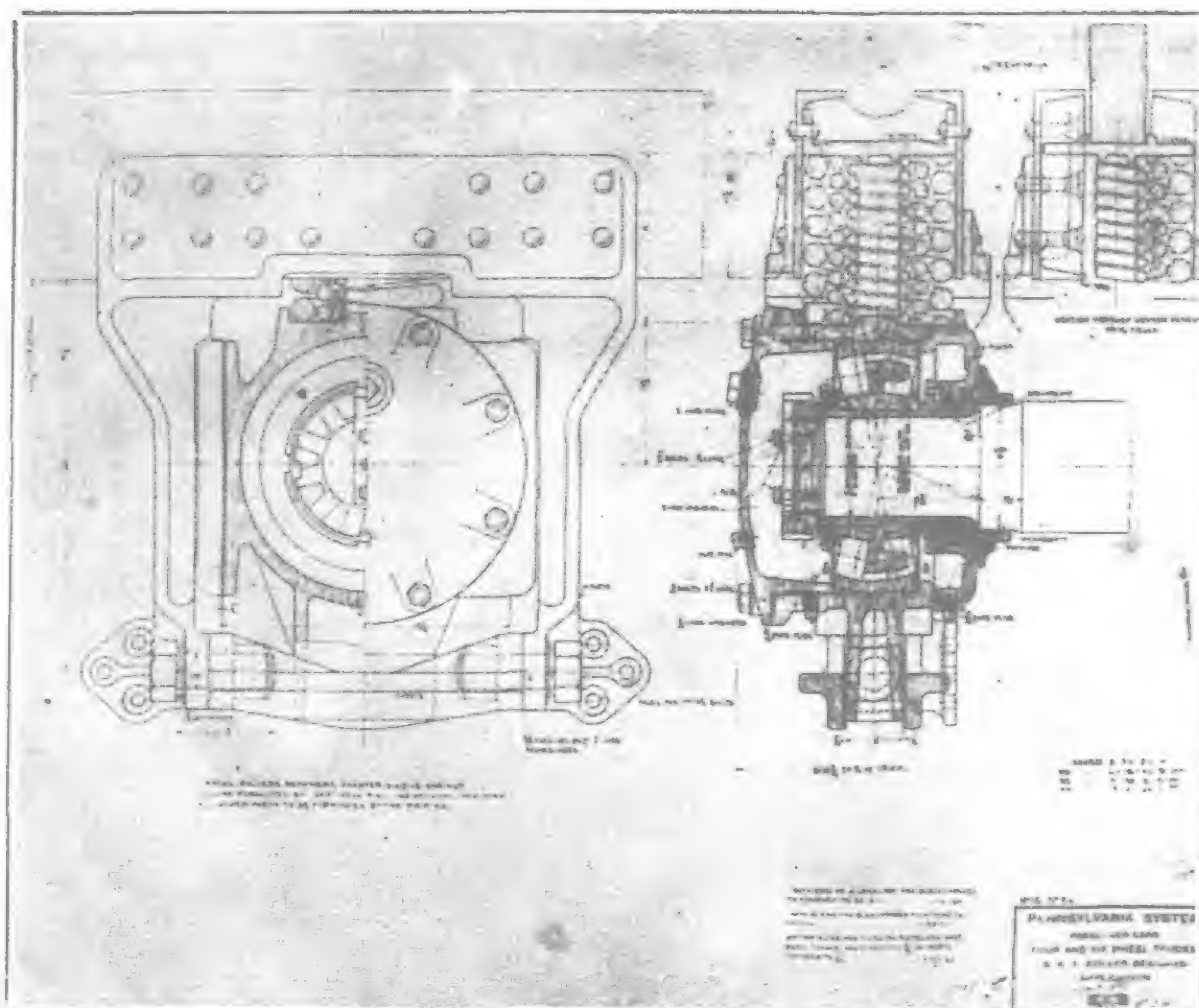


Fig. 9. Railway Box with one Spherical SKF Roller Bearing for an Important American Railroad

Having now proved in a practical manner that it is possible to produce roller bearings of a satisfactory durability and with perfect running security even for the severest traffic it will be of interest to all concerned in the economical running of railways to examine into the financial aspect of the proposition.

In considering this matter it is of course necessary to take account of all the various factors; but some of these, although of considerable importance, are not the ones which first drew attention to the possibilities of ball and roller bearings for this purpose. It is therefore natural to examine first into the results obtained in the reduction of power and starting effort, the possibilities of which originally drew the attention of designers to this subject.

It is interesting to note that these two factors, although effective in all railway work, are of different relative importance to different classes of traffic. For instance the saving of power is the more prominent factor in express passenger traffic; whereas in slow goods traffic the reduced starting effort required is of greater importance, under some circumstances, as it enables heavier trains to be hauled by a given locomotive where the weight of such trains is limited by the possible starting effort of the engine, this being particularly the case in cold climates where the starting effort of ordinary plain bearings is so very excessive before they get warmed up. Of course this question of starting effort may be of great importance in express passenger traffic also where the traffic is heavy and the length of trains is limited by it.

In estimating the amount of power that can be saved by the use of anti-friction bearings one has to first ascertain how much of the total draw-bar pull is required to overcome the friction of the bearings and how much is required to overcome the other forces which are met with, namely, the air resistance, friction between rails and wheels, curve resistance, resistance due to vibration during running, and resistance due to gradient; for it is obvious that these resistances are quite independent of bearing friction and each differs on different tracks and with different speeds. It is therefore quite impossible at present to lay down any definite formula that would cover all these different items and become universally applicable, so that in approaching this subject with regard to any particular line one can only base one's estimate on the figures obtained by experiment on other lines on which tests have been carried out and make as accurate allowances as possible for differences of running conditions.

A considerable amount of preliminary investigation has been carried out by a number of different people to establish data on which to base calculations of individual cases and the more important of the results obtained are shown by the curves given in Figs. 10 to 13.

Fig. 1 shows the result of tests carried out in the University of Illinois, U.S.A., to ascertain how train resistance is effected by the temperature in the case of plain bearing, and it will be seen by these curves that it falls off very considerably as the bearings warm up, rising again after the first stop of 15 minutes to its original figure and again slightly after the second stop of only two minutes. These tests show that a state of permanence is attained soon after a distance of about 20 km. has been run; so that this heating period is of comparatively little importance in

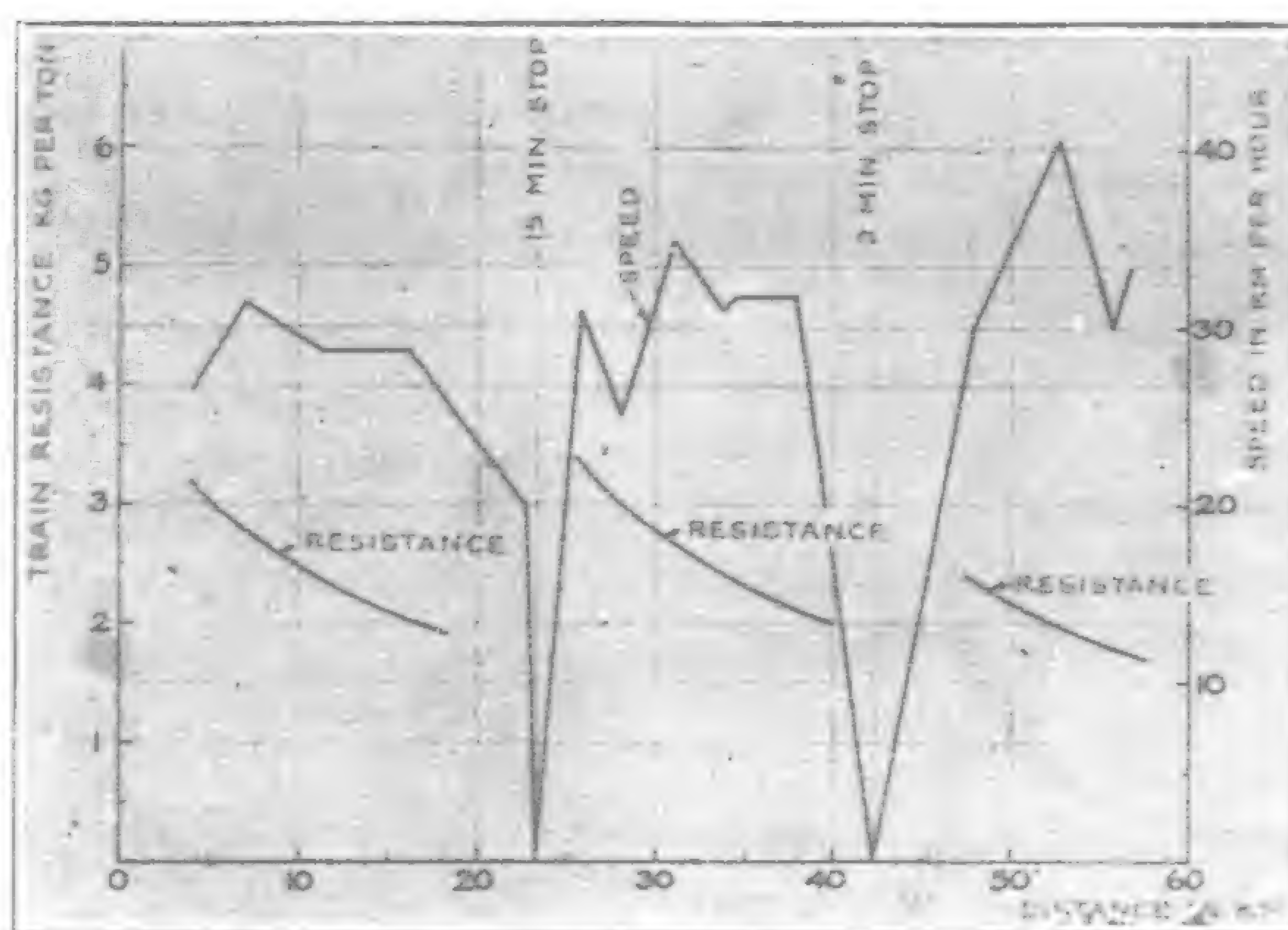


Fig. 10.

the starting resistance with ball or roller bearings is practically the same as the running resistance, as will be seen by Fig. 13.

Fig. 11 shows the variation of the running resistance made up of a combination of the bearing friction and air resistance at different bearing pressures in plain bearings as given by Rydberg. Fig. 12 gives the relation between the train resistance and speed in the case of bogie passenger cars with an axle load of 10 tons, while Fig. 13 gives similar curves for freight cars with an axle load of 15 tons.

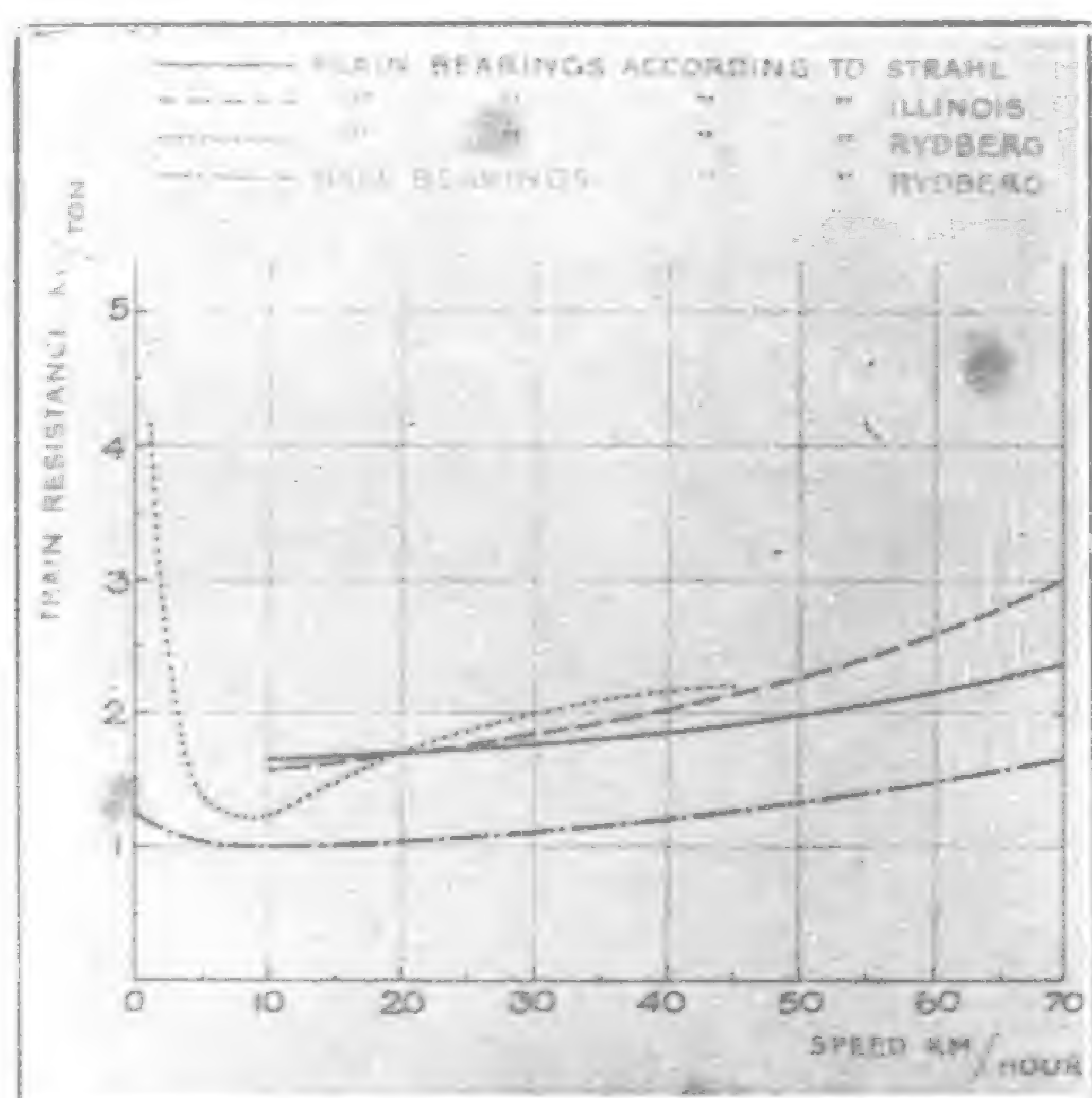


Fig. 11.

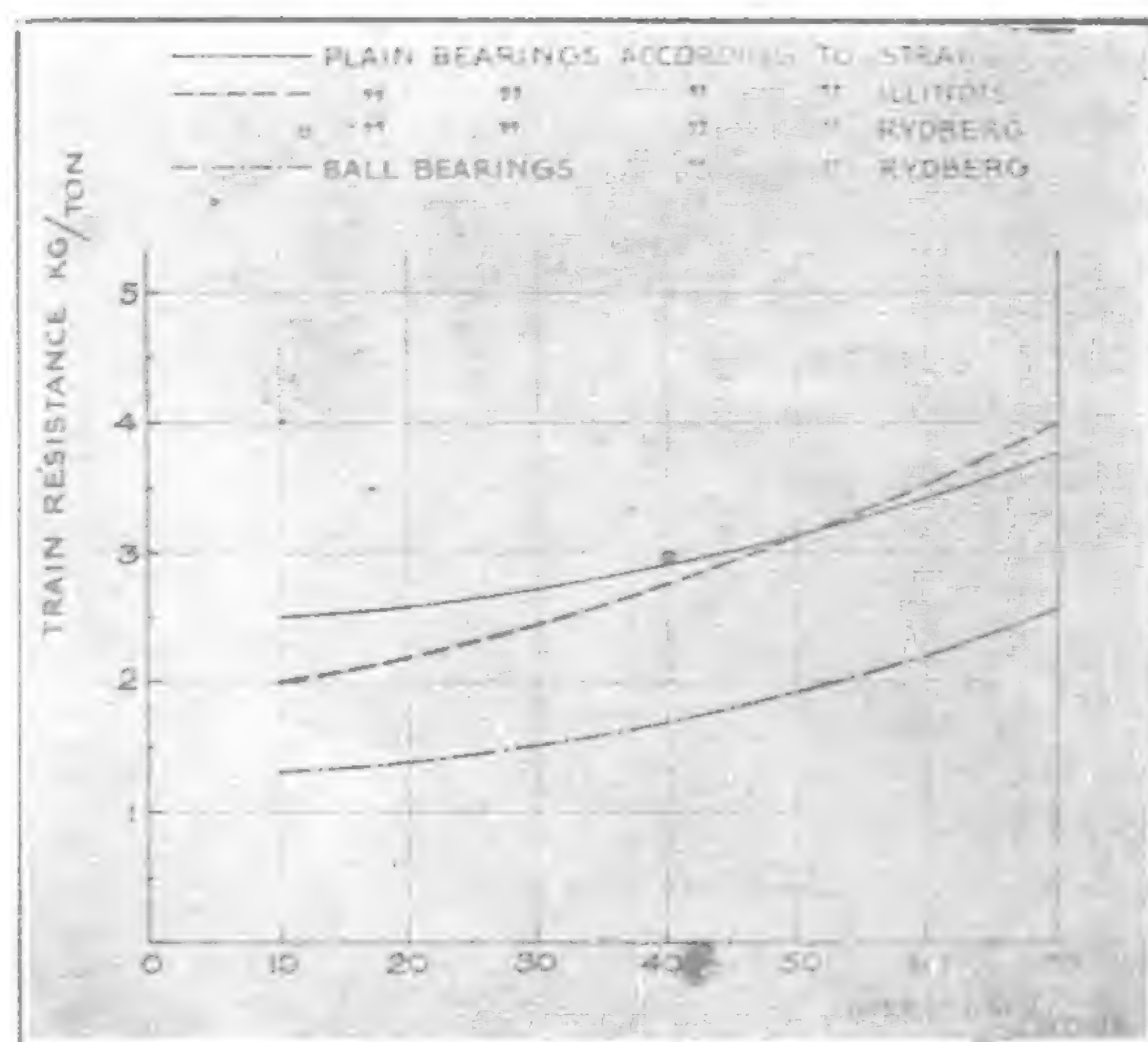


Fig. 12. Results obtained from Bogie Cars with axle loads of 10 tons.

long distance express service; but becomes of some importance in local service.

In considering this aspect of the matter it is necessary therefore in the case of plain bearings to consider their performance during three distinct periods namely,

- (1) The start
- (2) The heating period
- (3) The state of permanence

The resistance during starting is not dealt with in Fig. 1 but a pretty clear idea of what takes place is given in Fig. 13. Experiments carried out by Rydberg with ore waggon on the Swedish State Railway showed that the starting resistance of a three-axle loaded waggon with plain bearings weighing 46 tons was 9.5 kgs. per ton, and of a similar waggon with SKF ball bearings was only 1.35 kgs. per ton; which is in very close agreement with the tests recently carried out in England on the Great Eastern Railway where a 27-ton bogie car on roller bearings could be set in motion by one man whereas a similar car on plain bearings required seven men.

Similar tests have also been made in America where the average starting resistance for five bogie cars on plain bearings, each weighing 60 tons, was found to be 13.5 kgs. per ton, and in the case of ball bearings 2 kgs. per ton.

It has been found that this extra friction at rest in plain bearings commences immediately after the car has stopped and that, consequently, the extra starting effort required to overcome it has to be provided for no matter how long or how short a time the train has been standing.

This is of particular interest in the case of goods traffic where the length of a train is often determined by it. On the other hand

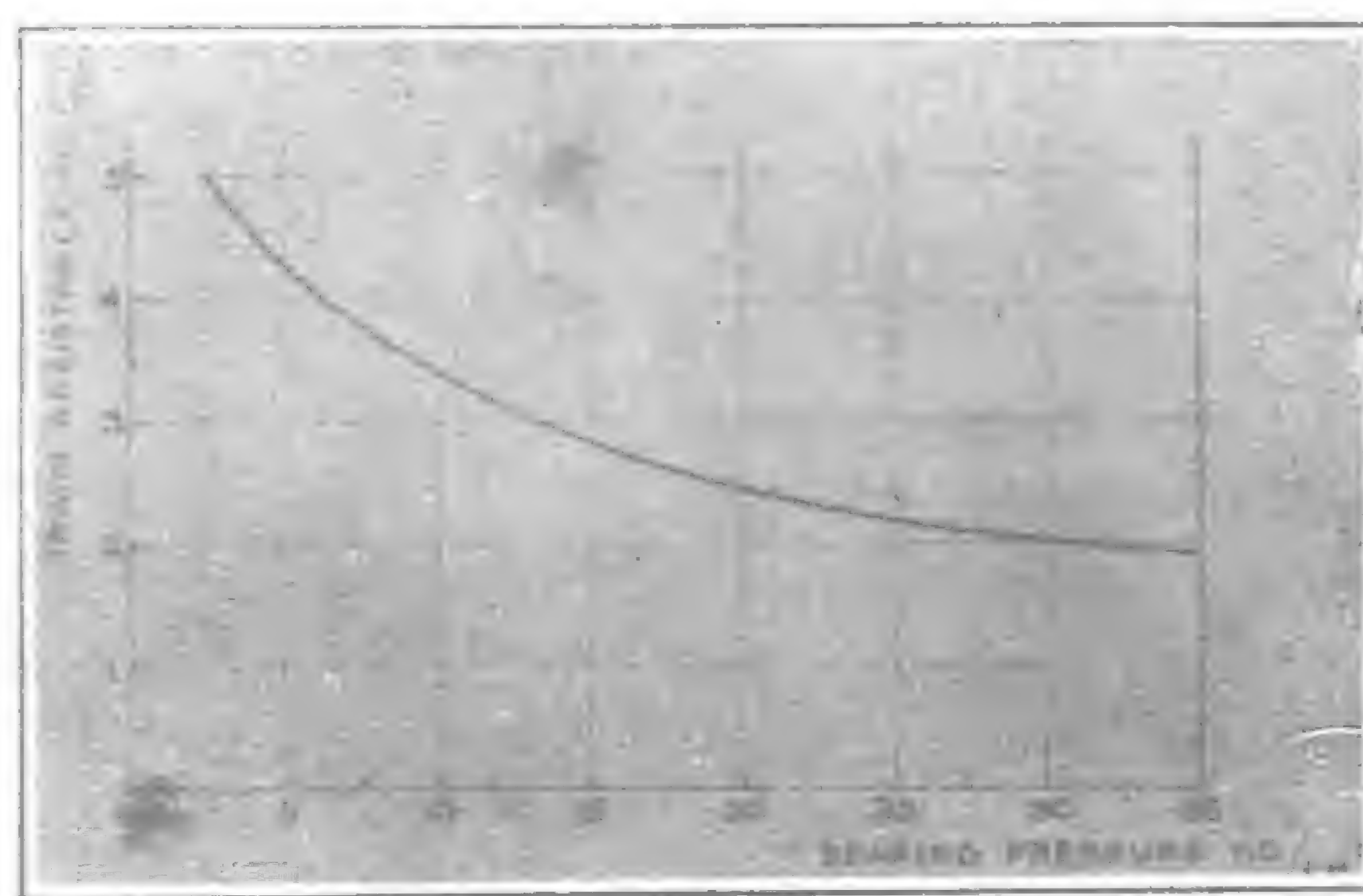


Fig. 13. Results obtained from Freight Cars with axle loads of 15 tons.

From these it will be seen that the difference in the running resistance at different speeds between plain and ball bearings is very nearly constant and may be taken as 1.1 kgs. per ton, in the case of bogie cars, and 0.6 kgs. per ton in the case of freight cars of the particular type used for the tests.

In the case of passenger traffic it is not as a rule possible to increase the length of trains and thus reduce their number on account of the service required by the public; so that the profit derived from the reduced train resistance resulting from the use of ball bearings is due to the saving of coal

and water under existing running conditions.

Practical tests of the saving of coal under normal running conditions have been carried out on the Swedish State Railways with two trains as much alike as possible, except that one was on plain bearings and the other on ball bearings. Each train consisted of one locomotive on plain bearings, weighing 107 tons, and eight bogie cars on plain or ball bearings respectively, weighing 37 tons each. The total weight of each train was therefore 403 tons. These trains were run daily during a period of ten days over a length of line of 243 km. great care being taken that the conditions of running were as near as possible the same.

The consumption of coal was measured by weighing the quantity on the tender before the start and after the finish of each trip. The maximum speed at which these trains were run was 90 km. per hour and several steep gradients had to be negotiated; so that a considerable portion of the train resistance was due to air resistance and the gradient. In spite of these disadvantages the saving in coal worked out approximately to 10 per cent.

These same trains were also run over a length of line of 105 km. and gave a coal consumption for the double trip of 2,321 km. for the plain bearing train as against 1,989 km. for the ball bearing train; which works out to a saving of 14 per cent. in favor of the ball bearings.

As it is reasonable to suppose that the reduction in coal consumption due to the bearing friction was the same per ton km. in both cases the difference in the percentage result must have been due to differences in coal consumption arising from other causes, and it is therefore best to consider the actual saving of coal in kms. and not as a percentage.

The saving at the above-mentioned test was 332 kms. the weight of the cars was 296 tons, and the distance run for the double journey was 210 kms. The number of ton/km. was therefore 63,000, and the saving of coal per 100 ton/km was 5.35 kgs.

It is interesting to see how these results compare with figures calculated from the curves referred to earlier, which give a reduction of resistance due to ball bearings of 1.1 kgs. per ton.

For a weight of cars of 296 tons, as above, the reduction would therefore be 296 by 1.1 or 324 kgs.

On a distance of 210 km. this represents an amount of energy of 68,000,000 kgm. or 252 h.p. hours.

As the locomotive is calculated to have a coal consumption of 1.2 kgs. per h.p. hour the reduction of friction represents a saving of 252 by 1.2 which equals 302 kgs. of coal.

As the saving of 332 kgs. was recorded in the actual tests these figures may be said to check up pretty closely and the tests confirm that the figure of 1.1 kgs. per ton, shown by the curves is a pretty safe one, so that a saving in coal of 5 kgs. per 1000 ton km. may be taken as the figure which can probably be used for most kinds of passenger traffic.

It should be observed here that the saving in coal depends on the efficiency of the locomotive and that, therefore, on tracks with steep gradients, where it is often necessary to use a later cut off in the cylinders than on level lines, with a consequent reduction in efficiency, the saving of coal per ton km. would be greater.

This point should be taken into careful consideration when estimating the possible economy on any particular line. The figure of 1.2 kgs. per h.p. hour is possibly on the low side for the conditions prevailing in the test case given above.

Turning now to the question of freight traffic, it is found that the actual saving of coal per car in a given period is less than in passenger traffic owing to the shorter distance covered, but that in addition to the saving in coal it is possible to effect a considerable economy by increasing the weight hauled by each locomotive and thus reducing the number of locomotives required to transport a certain quantity of goods, with, of course, a corresponding reduction in staff.

In order to investigate the possibilities existing in practice, extensive tests have been made on the Swedish State Railways with ore waggons hauled both by steam locomotive and by electric locomotives.

One train consisting of a steam locomotive and 30 ore waggons weighing 46 tons each on plain bearings and another train with the same kind of locomotive and 39 waggons weighing 46 tons each, on ball bearings were run ten times in each direction over a distance of 205 km. The consumption of coal and water was measured by weighing each trip.

For a trip with a loaded train in one direction and empty in the other an average coal consumption was registered for the train on plain bearings of 9.479 kgs. and a water consumption of 58.9 cubic metres, while for the train on ball bearings the coal consumption was 9.300 kgs. and the water consumption 57.8 cubic metres. It was thus possible on the line in question to increase the number of cars on each train by not less than 30 per cent. without increasing consumption of coal or using a heavier locomotive. As, moreover, the heating often met with in plain bearings during this heavy traffic is entirely absent in ball bearing waggons, it was found possible to transport the same quantity of goods with three ball bearing trains as with four plain bearing trains.

On another line with less favorable gradients and using electric locomotives, it was found possible to increase the number of cars from 30 to 35, using the same locomotive and with the same consumption of energy.

The economy to be derived from the use of ball bearings does not, however, end with the saving of power and reduction of number of locomotives as there are other items which must be taken into consideration, e.g., reduction in quantity of lubricant required, reduction in maintenance staff, freedom from dislocation of traffic due to hot bearings, etc., the last named of which may be in itself a sufficient reason to justify the change in the case of express passenger traffic.

Another point which is worthy of some consideration is that in large countries where rolling stock often gets away on to other lines for very long periods it is likely to get very scant attention until it returns to its own line, and the consequent wear and tear on plain bearings may be very excessive; whereas it is scarcely likely that cars will be away on other lines for long enough periods to run them short of lubricant if fitted with ball bearings.

Taking all these results into consideration it does not seem too much to say that the problem of the application of roller bearing to railway rolling stock has now been satisfactorily solved from both an engineering and economic standpoint and that their use will become increasingly general.

New York to Mukden!

Word comes from China, says the *New York Telegram*, that the little horse cars which used to operate on certain of the crosstown streets of New York are now giving an air of progress to the thoroughfares of Mukden.

They were first taken to Tokyo and used there. When that big town electrified its transportation system the cars went on their travels again and may end their career of usefulness in some other remote part of the interior.

It is a strange thing that these conveyances, which used to excite the derision of Westerners as an indication of what they were pleased to call "New York's backwardness," should be symbols of progress now in the dim and distant East.

Naturally, it was very irritating to have some visitor from Main street laugh and say, as he pointed at one of them jogging along,

that he had never seen a horse car or a gas lamp until he crossed the Hudson River. This used to make Manhattanites glare fiercely and remark that civilization didn't depend on such things. A poor retort, but it served.

Then there was the Chicagoan who said on one occasion: "I suppose the reason they go east on Twenty-eighth street and west on Twenty-ninth street is because they are ashamed to come back the same way."

However, you never can tell. A horse car, like a man, may be down without being out.

It would surprise some of the old New Yorkers if they went to Canton and took a trip out to Samshui on the railway. There would find some other old friends in the shape of old elevated railway locomotives still going strong, down but not out.

Sisal Cultivation in Papua

By Thos. J. McMahon, F.R.G.S.

HERE is a world-wide demand for hemp, many tropic countries are offering supplies but by no means in the quantities required. There is a pronounced shortage with no immediate relief. This fact brings into prominence the excellent opportunities for the cultivation of hemp in the island groups of the South Pacific. Investors, having experience in the cultivation of hemp, and ready to invest are offered splendid fields in such well settled groups as Papua, German New Guinea, the Solomons, New Hebrides and Fiji.

In these islands the climatic conditions are ideal, and the rainfall just sufficient to assure plants the most vigorous growth. To prove the perfect conditions for the cultivation of sisal hemp in the South Pacific Islands, plants brought from other countries instantly improve in stamina, diseases or pests are quite unknown, and government regulations are strict to prevent the introduction of diseases or pests.

As an instance of what can be accomplished in the islands in the cultivation of sisal hemp, what is going on in Papua, that is British New Guinea, is ample evidence of the success possible. Papua is an island group of 90,000 square miles, under Australian administration. The group is famous for its grand scenery, its wonderful fertility, its varied climates, and its interesting natives numbering over 300,000. There are parts of this territory, and of great extent, peculiarly adapted to the cultivation of sisal hemp. The dry belt on the Southwest coast from Hall Sound to Port Moresby, the capital of Papua, is eminently suitable for hemp. Out back from the capital are hundreds of acres of fine cultivations, sending annually large quantities of first-class fibres to Australia, England and America. But let it be noted not one-half of the quantity that is needed or ordered. In Australia alone the merchants would like to get ten times the quantities now received.

The most useful fibre known to commerce, that which comes from Florida, and the Bahamas, is the only sort cultivated in Papua. It simply

luxuriates in the dry clime, the full light, and the strong sun heat. When one looks around on the brown hills and gullies, the general bareness and the poor looking soils are discouraging. Then the eye roams over the wide acres of hemp, great armies as it were of huge spiked plants that look for all the world like giant pineapples.

The rain does not fall for nine months in the year, and then in that light and limited amount essential to the perfect growth of hemp. The soil is well drained and naturally so, containing abundance of lime, one of the secrets of success in cultivating hemp.

The cultivation of hemp in Papua offers inducements to men of limited capital. The outlay on clearing land, and the first cultivation is insignificant. Taking it for granted such an investor has experience in hemp, in the managing of native labor, a thousand acres should be made payable

in a few years and this attained with a starting capital of £2,000 (two thousand pounds).

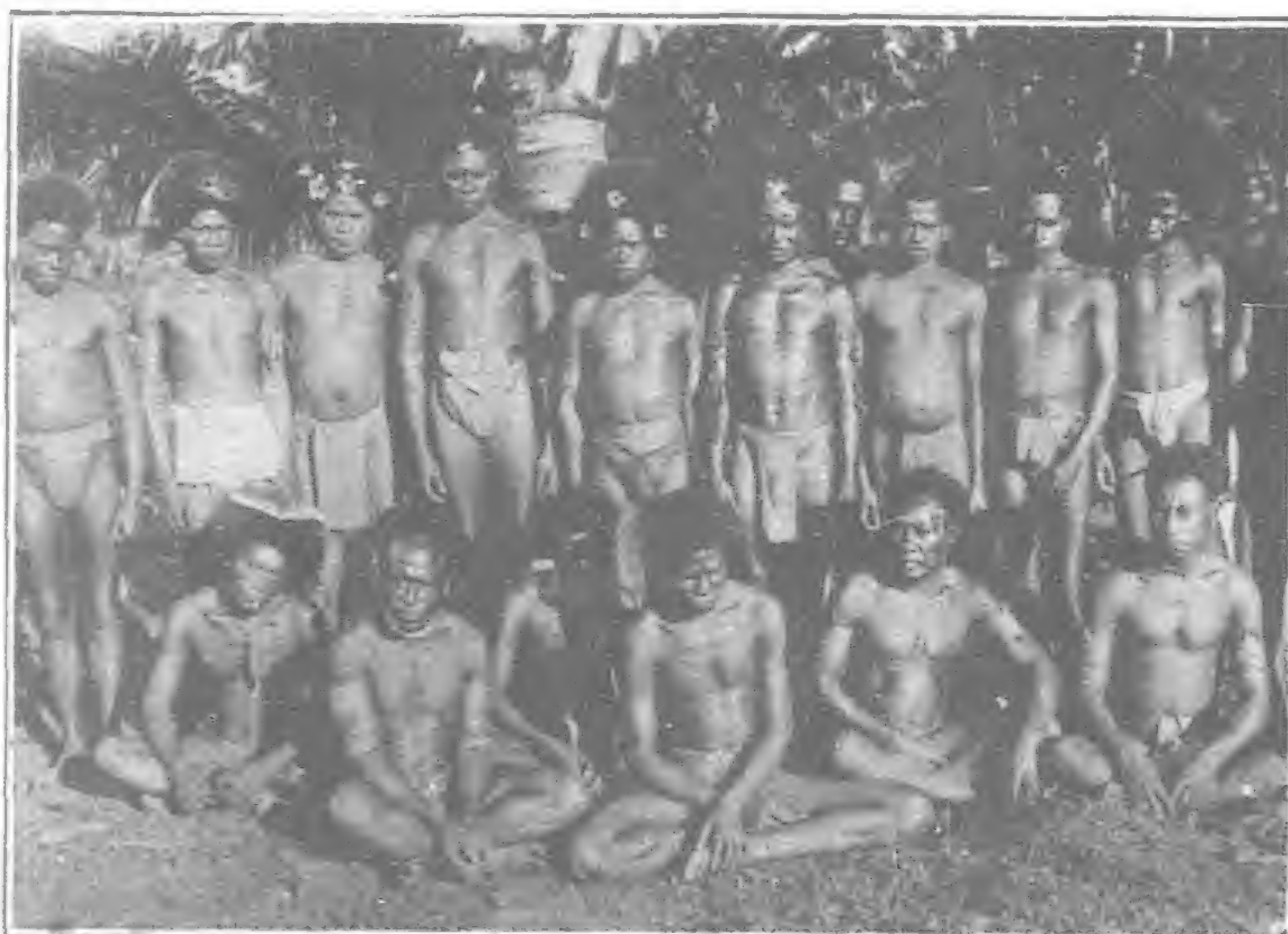
To describe a hemp cultivation in the region around Port Moresby will be the best way to show what is going on. Over hills and dales for what seems acres upon acres, run apparently endless rows of the stiff looking plants. In the centre of the estate is the homestead, a big village of houses and huts. The homestead is usually on a well watered river, navigable for fair sized steamers of say 200 tons, and drawing 12 to 14 feet of water.

Tram line criss-cross the cultivation extending many miles and converging to the hemp mill. Under a general manager, with several assistant managers, are possibly some hundreds of boys or native labor. These are ever employed keeping the grounds clean, the grass down, poling plants, removing suckers, destroying old plants, watching for sick plants, and harvesting.

The scene about a mill is full of noise and animation. Trucks laden with bundles of hemp leaves come tearing down slight inclines, the native shunters singing and yelling, running and jumping as if it all were sport and not work, and by their eagerness and merriment telling the tale of how well they



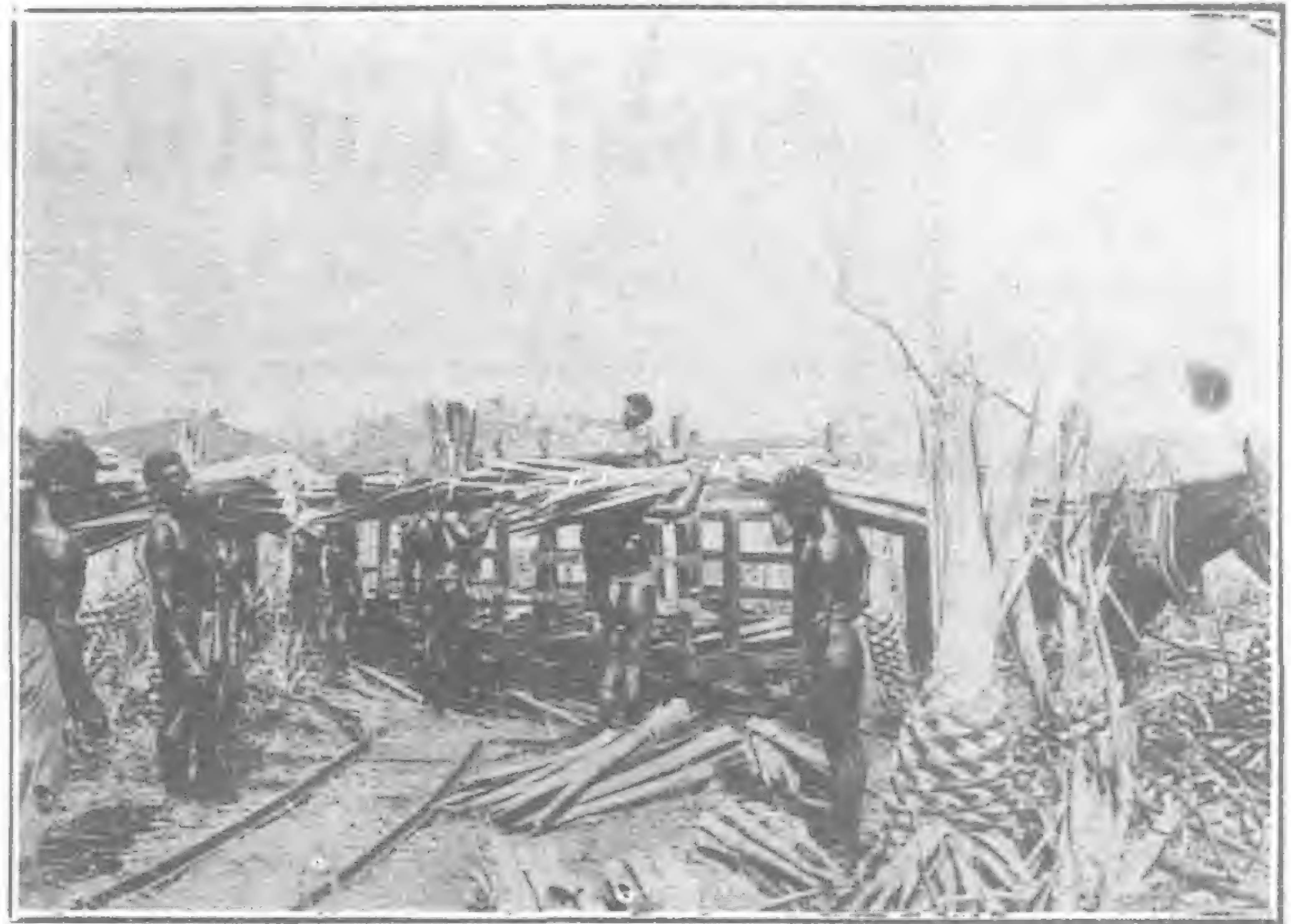
Port Moresby, the Capital of Papua



Native Workers on a Hemp Plantation, Papua



Sisal Hemp Plantation, Papua



Loading Cut Sisal Leaves on to Light Railway Car, Papua

are treated. From the mill comes the crash and hum of machinery, and again the never-ending sing-song of a small army of boys as they rush here and there untying and piling the bundles of leaves before a big machine which will presently tear them to the finest of silvery threads.

Another army of boys is busy under huge loads of wet, dripping, shredded hemp, spreading it along fences to dry in the sun. More workers are gathering the glistening fibre as it dries, hurrying off to the great drying shed, where it is sorted, bagged, and baled ready for shipment. The scene is a vivid one, the black shiny skins of the workers in contrast to the silvery, silken flax.

The fibre mill machinery is interesting and with the exception of a chief engineer, a white man and skilled man, the rest of the machinery attendants are natives. The hemp leaves are fed on to a revolving belt and carried through a long line of natives who straighten out the leaves ready to be gripped by the teeth of the crushing machine. Once within the crusher the leaves are torn or shredded, a powerful jet of water washing along the fibre, and carrying away the green pulp. The shredded fibre usually takes much washing, and is eventually thrown out of the machine when it is instantly taken up in armfuls by the workers and hurried over to the drying grounds.

A profitable sisal hemp plant must produce at least 100 leaves in its life of three years. A plant comes to maturity in about four years but its working or producing life is in Papua seldom allowed to be longer than three years. Keeping plants vigorous, those

producing full long leaves is an essential to success. About 33 tons of leaves, measuring three feet in length, or 25 tons of leaves measuring four feet, are required for one ton of dry fibre. One native worker can cut and load one ton of leaves a day.

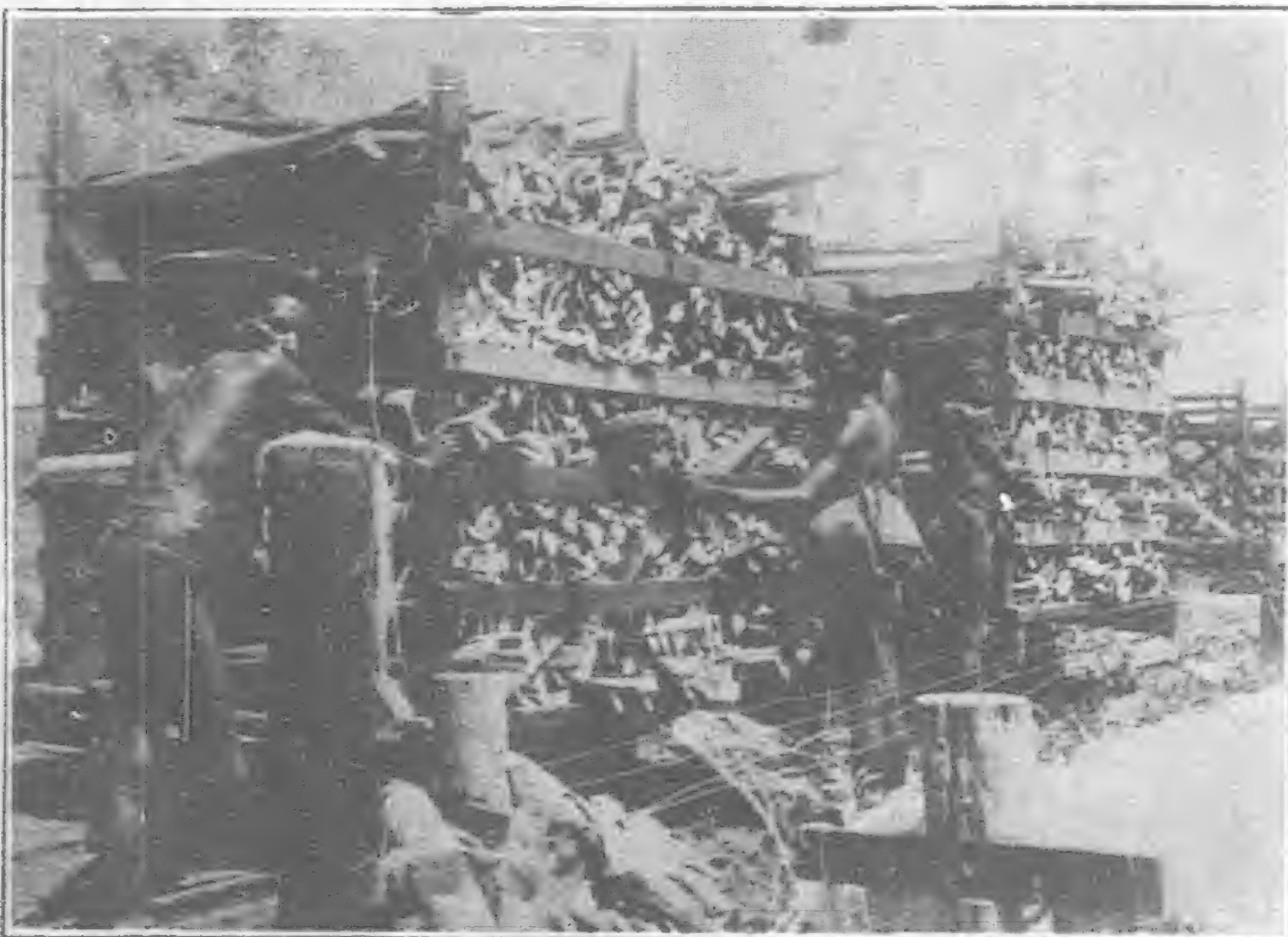
Native labor is cheap, the pay for a month ranging from 10 shillings for ordinary workers, to 60 shillings for competent "boss-boys" or machinery hands. Fifty good boys can plant a thousand acres in a few months, and it is estimated that one boy can take care of, and harvest, at least four to five acres a year.

Added to the wage is accommodation, food, the stated regulation hours per day, except Sundays—eight to nine—and medical attention. There is no need to exploit or overwork natives, the laws are very severe on this score. It is found that generous treatment can produce steady work with satisfactory and profitable results.

The native workers are housed with comfort, the married men have their own little huts, and the single men their long cool dormitories. All workers are fed frequently and liberally the chief items of food being rice, native fruits, and vegetable, and meat. Tobacco and biscuit are served out daily, these are free, and on some estates matches are sometimes added. Extra quantities of tobacco or matches the boys can get for small cost. On the big hemp estates boys called "gunmen" are kept constantly employed going into the jungles and shooting game, mostly pigeons, and these are given to the workers.

The well fed boy always looks well nourished a fact that tells in the favor of the employer when the government inspector comes round who examines the boys and questions them if they have any complaints to make. A working boy is a giant compared to the savage that roams and chases this food. The contentment of a body of native workers is manifest in their singing and dancing every night after work. As the sun goes down the beating of native drums is heard, and then with shouts of triumph and joy the singing and dancing begin. The boys would go all night but a curfew bell at nine o'clock reminds them that they must rest and be ready for the work of the morrow, and that the morrow also brings round another sing-song. From Saturday night, all night to Sunday night curfew time, there is an never ending roar of drums, and singing, and then having more time the chief dancers don the most gorgeous leaf and flower dresses.

There is not the slightest doubt within the next ten years Papua will attract much capital and a desirable and capable body of men, then the world will have little reason to complain of the shortage of hemp, for undoubtedly the cultivation of this tropic product is bound, under its perfect conditions, to spread, and thousands of acres and many mills will create a vast and splendid industry.



Transporting Sisal to the Shredding Mill, Papua

Some Electrical Developments in China

DURING 1922

WHATEVER may be said about the prospect of general industrial development in China, there can be no two opinions as to the immense possibilities for the expansion of electric light, power and traction in a country where countless cities, towns and villages await the coming of the lighting plant and the inter-urban trolley to facilitate traffic. Despite the wide spread trade depression of the past year, the development of electric light and power has increased. The use of light, heat and power is being more and more appreciated, and as a consequence, nearly all the larger plants have been compelled to increase their capacity. It is difficult to make an accurate estimate of the number and capacity of plants already in operation owing to the extreme reticence of Chinese plant owners and engineers who interpret inquisitiveness into their affairs as being in some way connected with a new schedule of taxation. The safest guide to new installations is generally the reports of the contracting and erecting engineers, but here again, it is not always possible to gather exact data because of the reluctance of giving out information that might be of service to competitors. However, we have been able to gather the following data on the principal extensions for the past year, together with some excellent photos of work in progress or installed.

Naturally, the most spectacular showing in new work is found in the larger treaty ports such as Shanghai, Hankow, Tientsin, Canton, Foochow, Mukden, Peking and Hongkong and the Japanese South Manchuria Railway enterprises in Manchuria. These latter

will be treated in a separate article in the February or March number. The new Tientsin plant was fully described in the October number of THE FAR EASTERN REVIEW.

Shanghai

Shanghai easily heads the list with 185,364,746 units sold during 1921, with a maximum demand for 41,074 kilowatts. By the end of 1921, the installed plant at the Riverside power station totalled 78,000 kilowatts, but with two additional 20,000 k.w. turbo-alternating sets and two 3,000 k.w. machines for operating the auxiliary plant in the power house, the total capacity will amount to 121,000 k.w. during 1923.

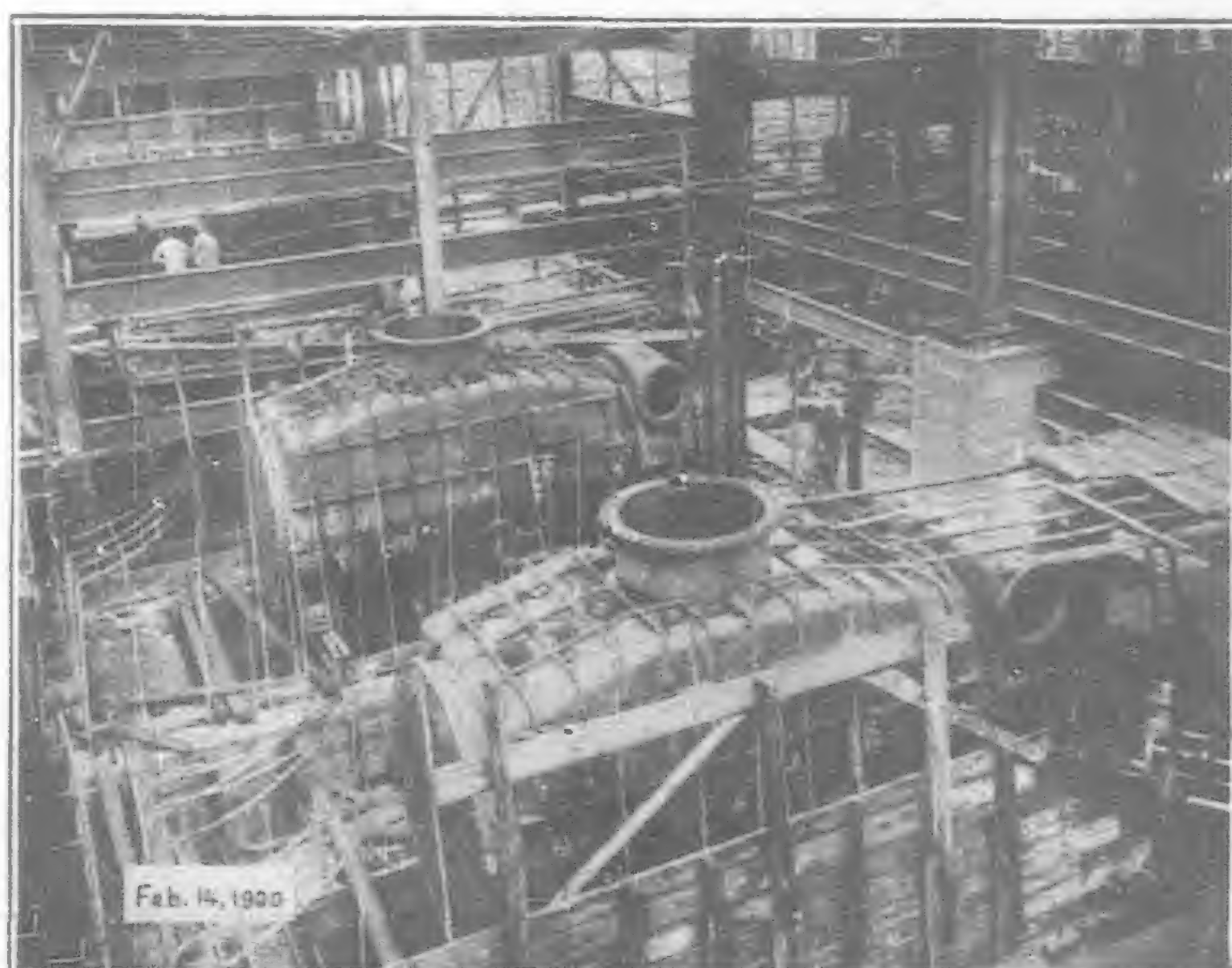
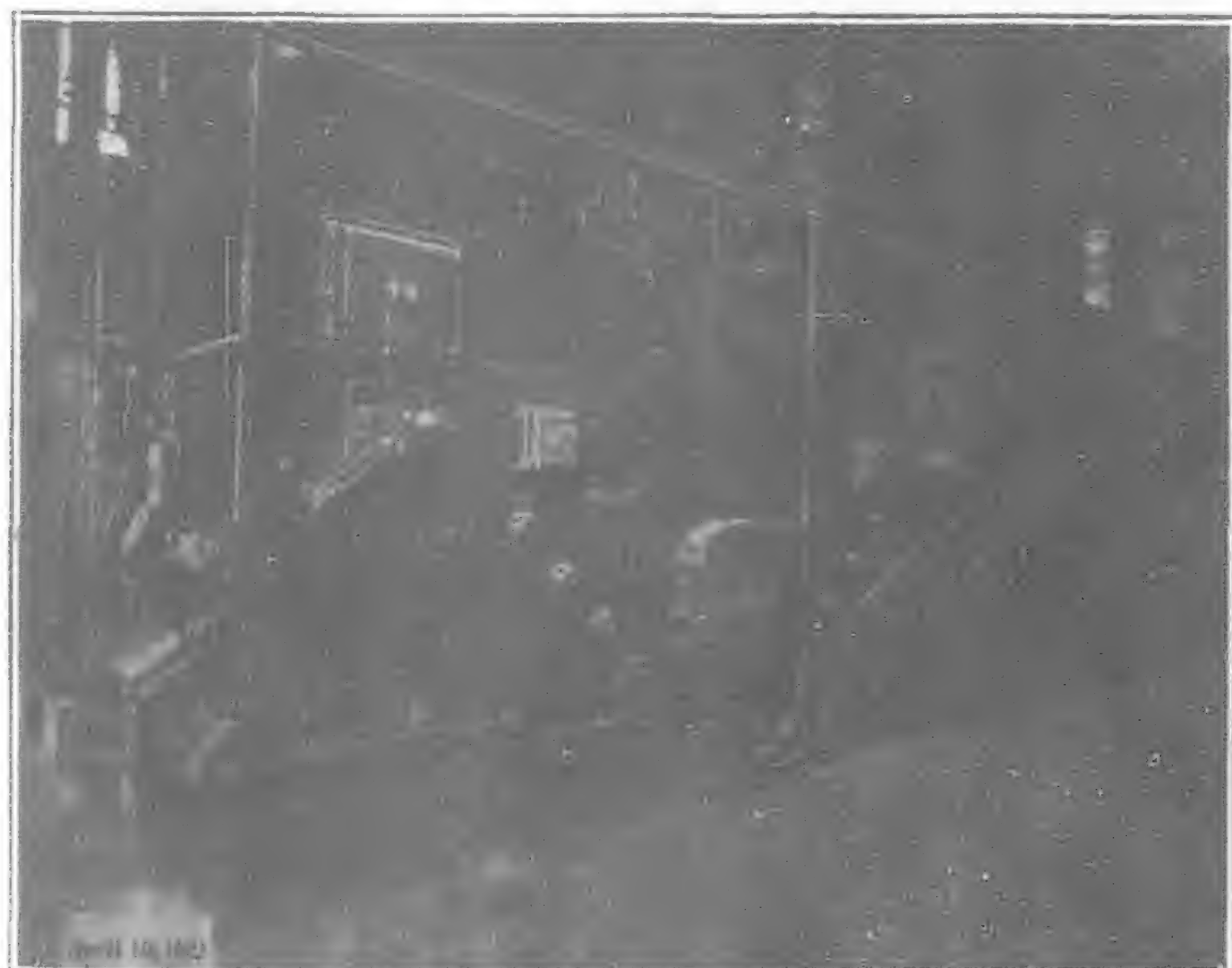
The feature of this new installation will be the two 20,000 k.w. turbo-alternating sets, one from the Metropolitan Vickers, Ltd., and the other from the C. A. Parsons & Company, Ltd. The two 3,000 house turbo-sets are also from the Metropolitan Vickers, Ltd. It is too early as yet to give the full particulars of boiler, stoker, feed pumps, coal handling, condenser, switchboard and other new plant to take care of this expansion, but we hope to do this as soon as the plant is erected and in operation. We

give, however, the illustration of one of the Metropolitan Vickers 25,000 K.V.A. stators being loaded into a barge at the works for ocean shipment to Shanghai, and at the end of this article will be found a description of this set.

The Riverside power station of the Shanghai Municipal Electricity Department is not yet working under ideal conditions, and at the rate the settlement is forging ahead as an industrial centre,



Kwangtung Electric Supply Company's New Power Plant at Canton: Concrete Mat during Construction



KWANGTUNG ELECTRIC SUPPLY COMPANY

Andersen, Meyer & Company Installation

Murphy Automatic Stokers used with 750 H.P. Stirling Boilers

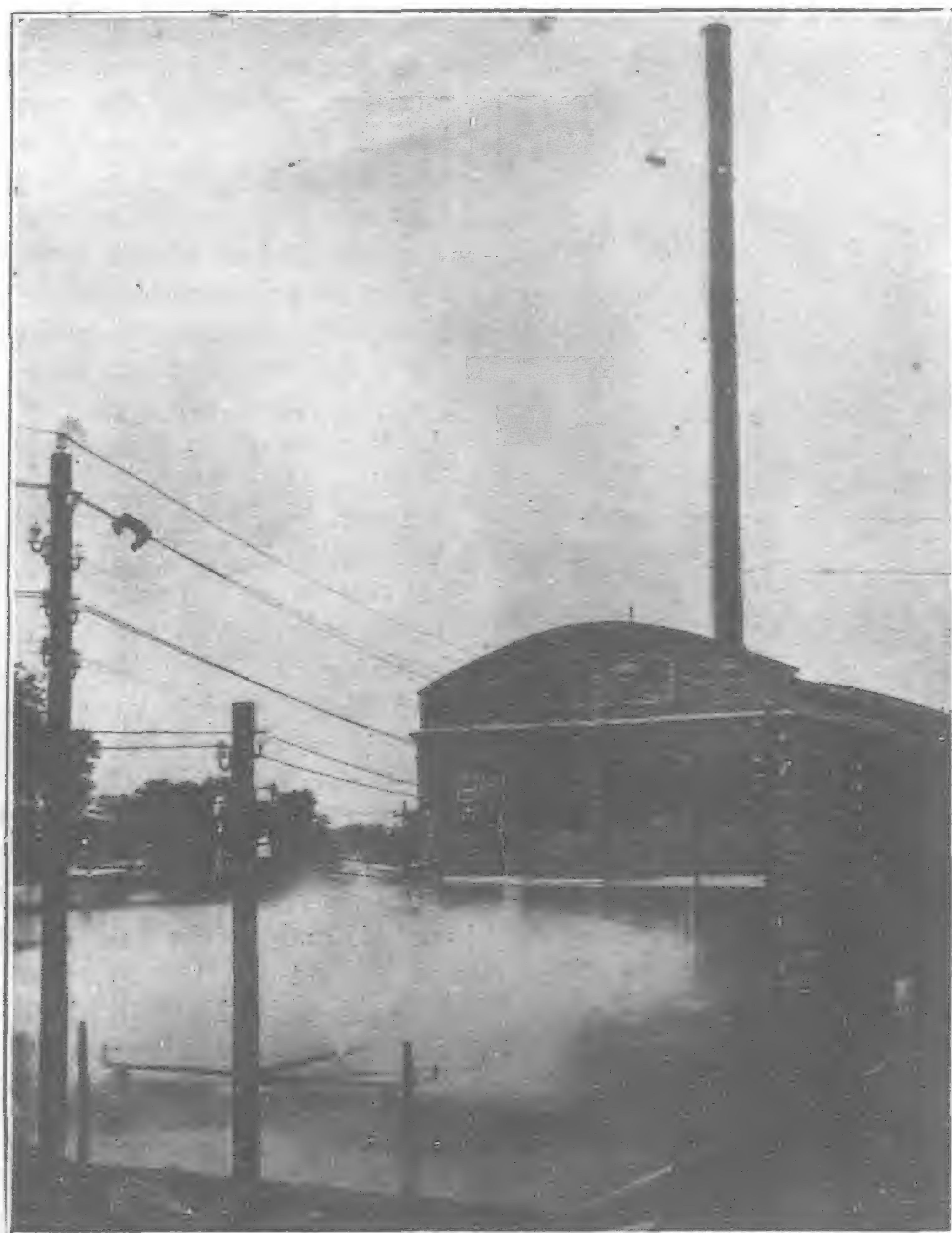
Worthington Condensers for 2—2,500 k.w. Turbines placed in position

calling for the rapid expansion of the existing plant, it is quite likely that when the new equipment is in operation preparation will be under way for further extension. If the present rate of expansion is maintained, the Shanghai municipal plant will out-distance many of the larger plants in Europe and America. The following table will indicate better than anything the position of the Shanghai undertaking in comparison with others:—

Year	Undertaking	Units sold	Maximum	Load
Ending		per annum	demand	factor
			in K.W.	%
1921 ..	Manchester	199,618,813	89,500	25.46
1921 ..	Shanghai	185,364,746	41,074	51.5
1921 ..	Glasgow	154,175,830	76,964	22.87
1921 ..	Sheffield	141,361,701	66,463	24.28
1921 ..	Birmingham	136,921,417	67,100	23.29
1920 ..	Liverpool	86,333,510	38,317	25.65

ing a vacuum of 28½-in. with cooling water drawn from the harbor. The circulating pumps are driven by standard vertical spindle motors rated at 300 h.p. continuously at 600 r.p.m. when supplied with three-phase current at 50 cycles, 350 volts. The extraction pumps are of the horizontal type and also motor driven. The air pumps are of the Willans Muller air ejector type, the two operating pumps being mounted on the same bed-plate as the extraction pump. Wet air filters are provided, the air ducts forming part of the turbine foundations. The clean, cooled air is drawn through the alternator by fans mounted at either end of the rotor. The voltage is controlled by automatic regulators mounted on the switchboard, erected on a gallery overlooking the generating room.

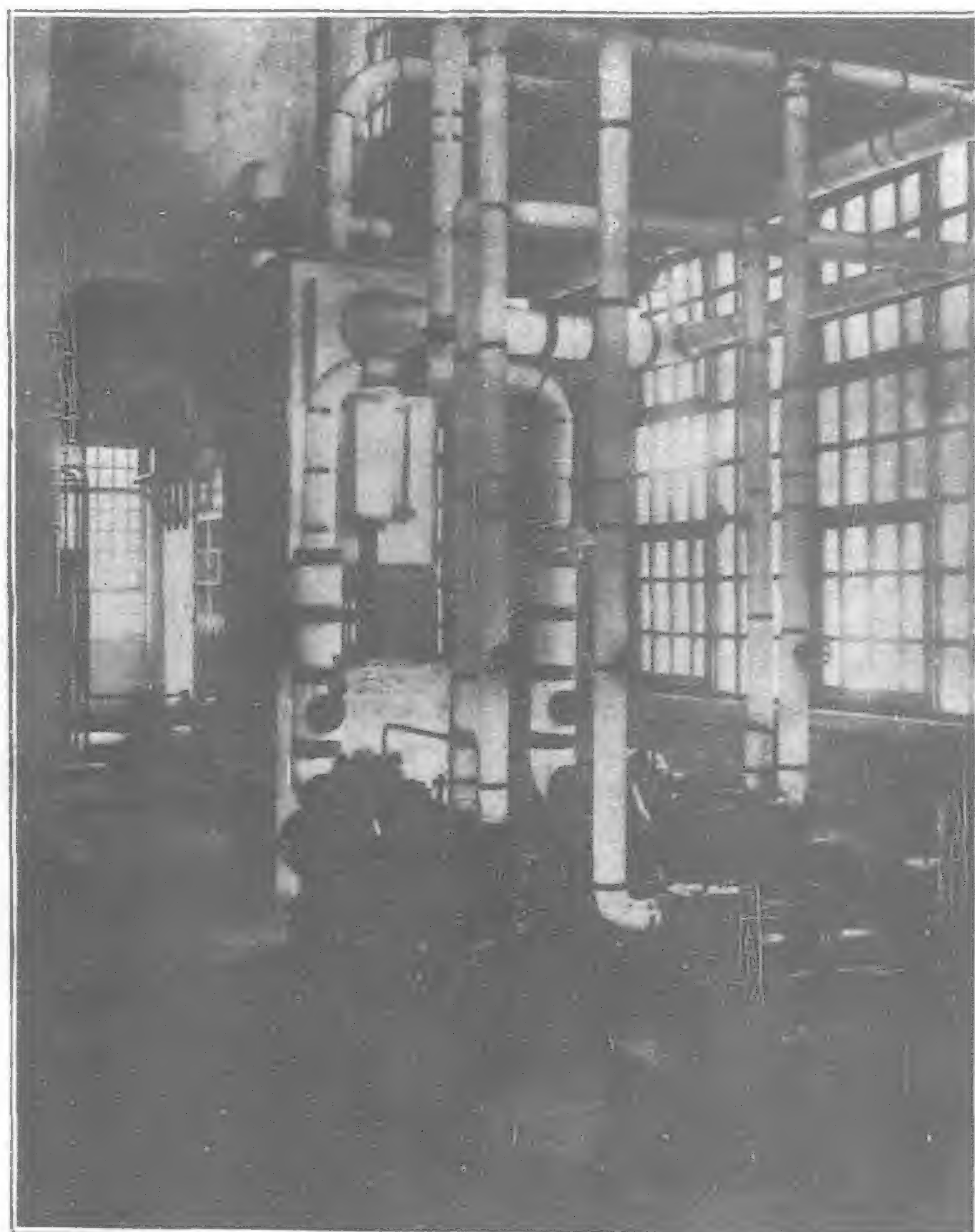
In the December, 1904, number of THE FAR EASTERN REVIEW was published a complete description of the original power plant of the Hongkong Tramway Company consisting of two units of Dick, Kerr (English Electric Co.) generators direct con-



TAI YUAN FU ELECTRIC LIGHT PLANT

Andersen, Meyer & Company Installation

Showing Cooling Pond. Note absence of smoke from stack, with boilers under full load.



Typical Piping arrangement, showing Feed Pumps, Heater Tank, etc.

English Electric Installations Hongkong

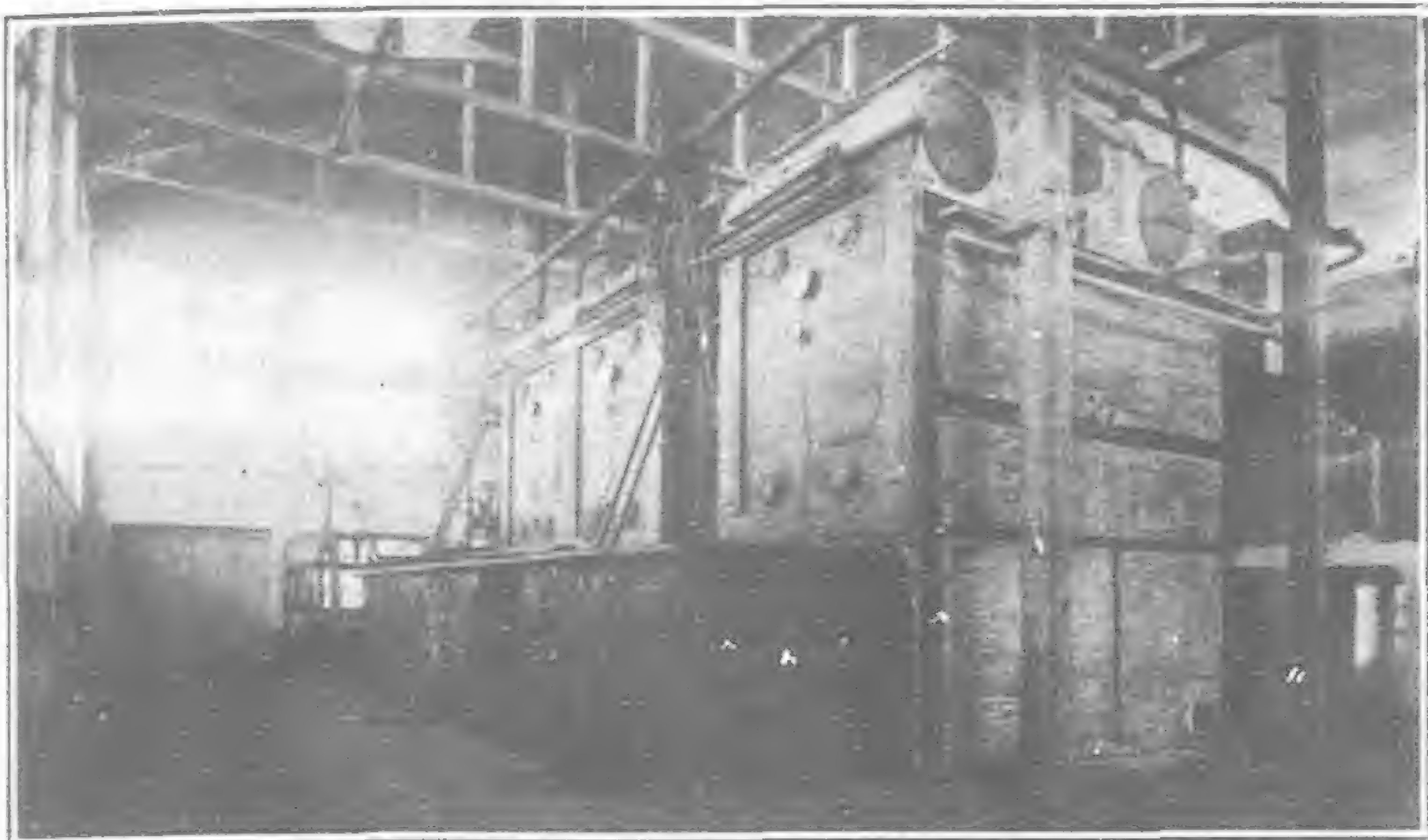
Next in importance to the 46,000 kilowatt spectacular expansion of the Shanghai municipal plant is the 15,000 K.V.A. addition to the plant of the Hongkong Electric Company, and here also the orders have been placed with a British manufacturer. The original generating plant consisted of two British Thomson Houston sets.

During 1921, orders were placed in London through the consulting engineers to the company (Messrs. Preece, Cardew & Rider) for two 7,500 K.V.A. English electric turbo-alternators of the impulse type, designed for 3 phase, 50 cycles, 6,600 volts when running at 3,000 r.p.m. The first unit was installed early in the year, as shown in the illustration, since when, the second set has been erected. The condensers are of the standard surface type capable of maintain-

ing a vacuum of 28½-in. with cooling water drawn from the harbor. The circulating pumps are driven by standard vertical spindle motors rated at 300 h.p. continuously at 600 r.p.m. when supplied with three-phase current at 50 cycles, 350 volts. The extraction pumps are of the horizontal type and also motor driven. The air pumps are of the Willans Muller air ejector type, the two operating pumps being mounted on the same bed-plate as the extraction pump. Wet air filters are provided, the air ducts forming part of the turbine foundations. The clean, cooled air is drawn through the alternator by fans mounted at either end of the rotor. The voltage is controlled by automatic regulators mounted on the switchboard, erected on a gallery overlooking the generating room.

Mill Work

In addition to the Hongkong extensions, the English Electric Company has supplied three 1,250 K.V.A. turbo-alternating sets, two to cotton mills and one a Chinese government railway department. All these sets are of the disc drum type, designed for a steam pressure of 200-lbs. per square inch, superheated 200 degrees



Heng Yuen Textile Company: 3 Stirling Boilers with Murphy Stokers.

Fahr. The condensers in each case are provided with rotary jet air extractors, the pumps for which are driven by the motor driving the condensate extraction pumps. Vertical spindle circulating pumps are provided to deal with water under wide variations of head. The sets are designed for a vacuum of 27 inches with cooling water at a temperature of 90 degrees, and the condensers give 29.5 inches with cold water.

Traction

As regards traction work, the English Electric Company has supplied 20 sets of 40 h.p. motors with controllers for the new railless cars for the Shanghai Electric Construction Company operating the tramways in this port. These motors are designed for a maximum speed of 20 miles per hour when the motor car is loaded to its utmost capacity and drawing a trailer car also fully loaded. These motors are wound for 500-550 volts.

Considerable new equipment was also supplied to the Hongkong Tramway Company, largely of the two motor type consisting of standard ventilated tramway motors with "D. K." controllers. These ventilated motors seem specially adapted for working in the hot and humid climate of Hongkong under severe conditions as to traffic and loading.

Peking

In Peking, the French associates of the English Electric Company (Les Constructions Electriques de France) secured the contract for the supply of the rolling stock for the new tramways through the Anglo-French-China Corporation. This equipment is also of the two motor type, with series parallel controllers and the trucks are of metre gauge. Three important contracts for industrial motors were completed. Acting as sub-contractors to the turbine-builders (Belliss & Morcom, Ltd.) the English Electric Company

also supplied the Peking Chinese Electric-Light & Power Company, with a 2,500 k.w. turbo-alternator with dry air filter, motor-driven pumps and high-tension transformers.

International General Electric Additions

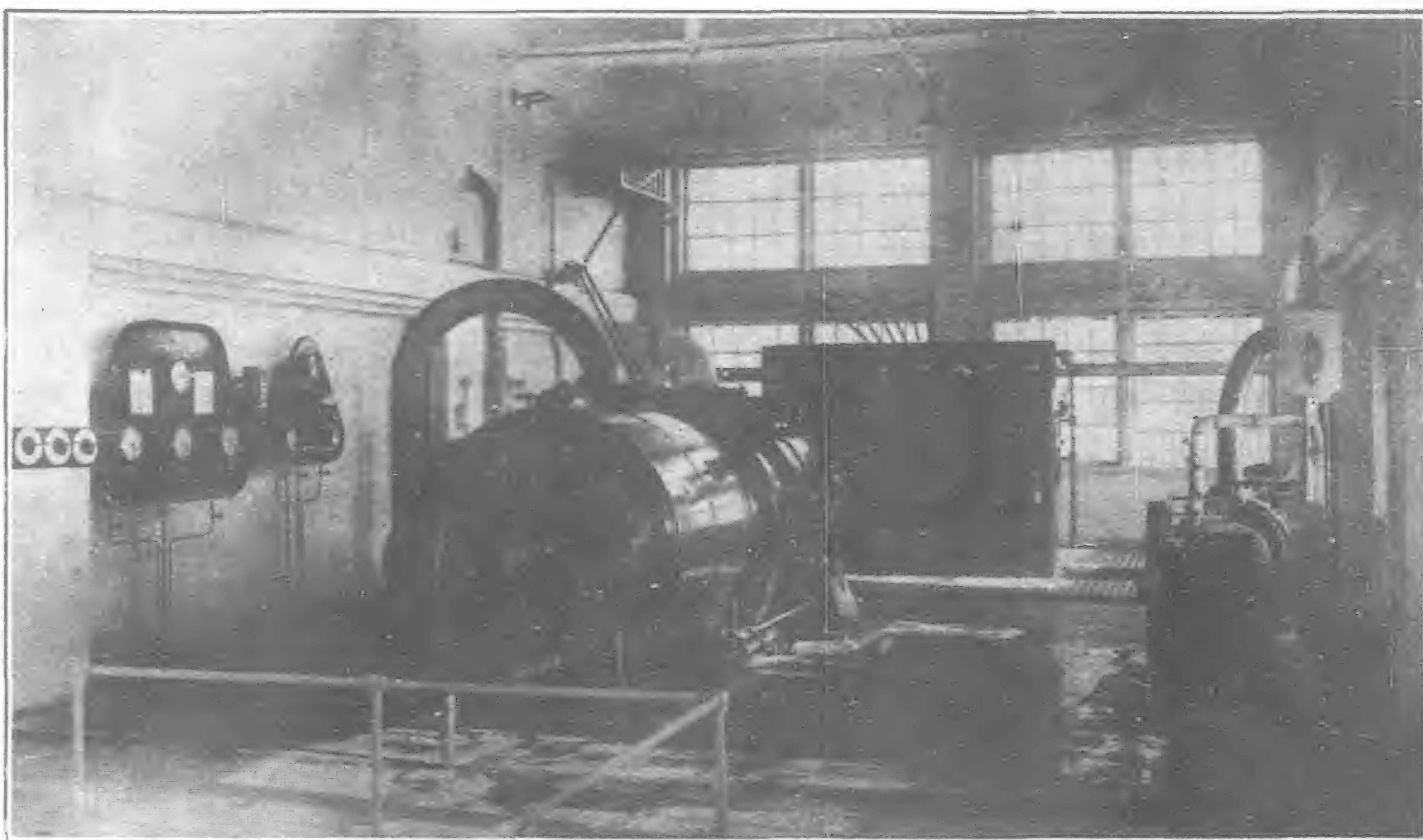
The most active in advancing the sale of American electrical machinery in China during the past year has been the firm of Andersen, Meyer & Company, acting as the representatives of the International General Electric Company. In fact, this firm has taken the lead for several years in purely Chinese electrical installations, and during the past year obtained contracts for the extension of several power stations in order to take care of the increased demand. The most important of these extensions is the plant at Canton.

Canton

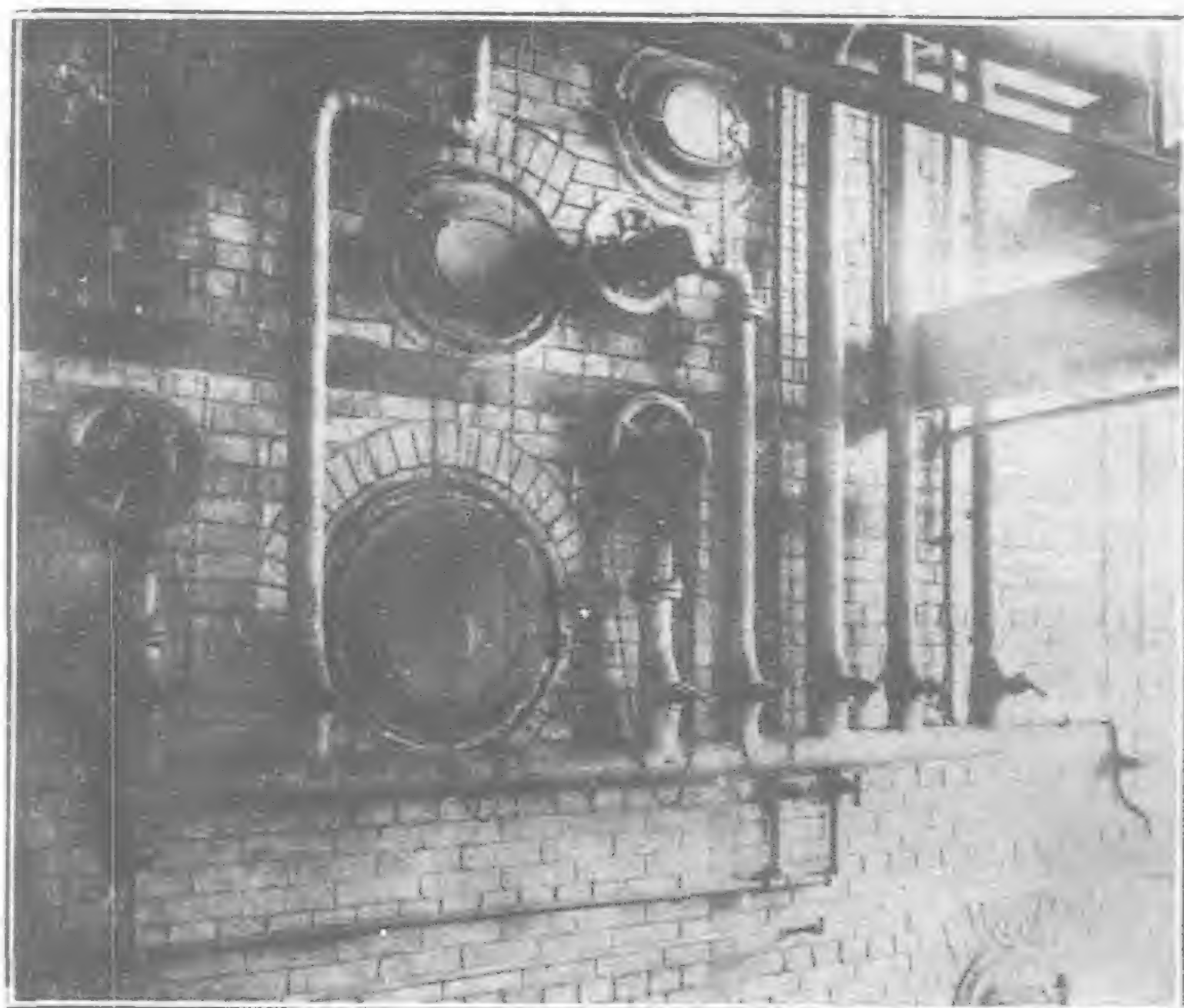
The demand on the system of The Kwangtung Electric Supply Company has grown so rapidly, it became necessary to refuse requests for power because the load would have been such that no

proper reserve would be available in case of breakdown or equipment being out of service for necessary overhauling or repairs.

The present boiler room equipment consists of four Babcock and Wilcox Stirling water-tube boilers, each having approximately 7,500 sq. ft. of heating surface, constructed for a continuous working pressure of 225-lbs.



Heng Yuen Textile Mill: Power Plant
Andersen, Meyer & Company Installation



Heng Yuen Textile Mill: Diamond Soot Blowers attached to Stirling Boilers

per square inch, and fitted with Babcock & Wilcox integral superheaters, capable of imparting a superheat of 150° to the steam when the boilers are operated at normal rating. These boilers are equipped with Murphy automatic stokers of suitable size so that the boilers may be operated at a rating or approximately 160 per cent. of normal rating. Green economizers are installed, as is also Green induced draught fan equipment. The boiler equipment is arranged in two batteries, of two boilers each, which face one another across a firing aisle, and one economizer is mounted above each battery of boilers, together with its induced draught fan—one unit, therefore, consisting of two boilers, one economizer and one fan.

The boilers are fed by means of Worthington centrifugal turbine driven boiler feed pumps, water being taken from the hot well to a Harrison Safety Boiler Works' open type metering feed water heater, and from there to the feed pump suction. The feed pumps deliver the water to the economizers, and thence into the boilers.

The generating equipment consists of two International General Electric Co.'s turbo-generators, each rated at 3,125 k.v.a.



Kirin Electric Light Plant: Note absence of Smoke; Boilers under Full Load. Andersen, Meyer & Company Installation

3 phase, 60 cycles, 2,300 volts, 3,600 r.p.m., constructed for a steam pressure of 210-lbs., with a superheat of 140° and a vacuum of $28\frac{1}{2}$ -in. Each of these turbo-generators is superimposed on a Worthington surface condenser of appropriate size, which condenses the exhaust steam and from which two Worthington hot well pumps—one motor driven and one turbine driven—withdraw the condensate and deliver it to the hot well tank previously mentioned. One of these hot well pumps, of course, is normally in reserve; and it is usual to operate the turbine driven pump in order to obtain a maximum temperature of feed water in the heater and also to allow of the maximum output of the turbo-generator.

The air pumps for the condensers are of the well-known Worthington R.D.V. type. One air washer is used for the two generators, and this is found to be a very suitable arrangement. Local conditions render it necessary to adopt this procedure.

The switchboard consists of the International General Electric Co.'s benchboard type for the control of each of the above-mentioned

turbines, and also the motor-driven exciters which are provided as reserve, and further a number of outgoing feeders. The main switches for these circuits are located in concrete cells on the floor below the switchboard and are electrically operated. The direct current side of the spare exciters is controlled by a vertical board separate from the benchboard.

In addition to the above-mentioned electrical equipment the station is equipped with voltage regulators for the outgoing feeders in order to maintain the voltage on these feeders at a constant value, thereby increasing the length of life of all connected apparatus and also the necessary lightning arresters, choke coils, etc.

As stated above, it has recently become necessary to increase the capacity of this station, and a contract has been closed for an extension, consisting of two boilers duplicates of those at present existing, to be set singly on opposite sides of the firing aisle, each having an economizer approximately half the size of each of the existing economizers set above it. The boilers will be operated by compartment type stokers in order to burn successfully an anthracite coal. All of this boiler room equipment is of Babcock & Wilcox Co.'s manufacture.

Each boiler unit will be provided with a forced draught turbine-driven fan and an induced draft motor-driven fan in order to allow of the boilers being brought up to a high rating at very short notice. This is necessary on account of the exceedingly steep load curve which applies to this station at certain periods of the day. It is interesting to note that the boiler equipment is capable for short periods of time of being operated at a maximum of about 300 per cent. of normal rating. The fans are of the well-known Green Fuel Economizer Co.'s manufacture.

The International General Electric Co.'s turbine being supplied under this contract is 6,250-KVA, 3 phase, 60 cycles, 2,300 volts, separately excited, and is suitable for the same steam conditions as the existing machines. It is in the same manner mounted over a Worthington condenser, which is equipped with two Worthington hot well pumps, one motor and one turbine driven, and two air ejectors, with inter-coolers, for the extraction of gasses from the condenser.

In regard to the pump house: there will be installed, when the present extension is completed, three 20-in. Worthington centrifugal pumps, two of which are motor driven, and the one now to be installed being both motor and turbine driven, with suitable arrangements, such that in case of failure the current on the motor for any reason the load will automatically be taken up by the steam turbine. An air washer having a capacity of 19,000 cu. ft. of air per minute, is also provided.

With regard to switchboard equipment: exciter panels of the benchboard type are being provided to control the generator and numerous feeders, among which are included four underground feeders. A spare exciter, driven by a 2,300 volt electric motor, is also provided, of sufficient capacity to give the necessary exciting current for all three machines when operating at the same time.

It is expected that this equipment, when installed and in running order, will take care of the then existing load and allow of one of the smaller machines as spare. It is contemplated to put this machine into operation about the 1st of January, 1924.

Tientsin

Another contract for extension which has been placed this year is that of the Pei Yang Cotton Mill in Tientsin. This plant originally consisted of one 800-k.w., 3 phase, 60 cycles, 600 volt turbine to deliver power to the cotton mill.

The boiler room equipment consisted of two Babcock & Wilcox longitudinal drum boilers, each having 4,020 sq. ft. of heating surface and being equipped with integral superheaters. The boiler equipment delivers steam at 225-lbs. per square inch, with 2,000 superheat. The boilers are also equipped with Babcock & Wilcox stokers, complete with necessary engine and shafting for drive.

Installed in this station is a Green fuel economizer, it being found very desirable in cotton mill power plants to install economizers by virtue of the high load factor under which these plants operate.

The condensing equipment consists of a Worthington surface condenser, having 3,500 sq. ft. of cooling surface and two 12-in. circulating pumps, one motor driven and one turbine driven. These pumps are located in a pump house on the river bank, which is some 3/400 feet away from the power station. One motor-driven and one turbine-driven hot well pump is provided, one of these pumps being normally in reserve; and the air extraction is carried out by means of a R.D.V. pump. All of this condensing equipment is of Worthington Pump & Machinery Corporation manufacture.

This station is complete with an open type feed water heater, an induced draught fan, feed pumps, feed water regulators and feed pump governors, and it is also complete with Diamond soot blowers with each of the boilers, which enable the soot and dirt to be removed from the external heating surface of the boiler without interfering with their operation.

Kirin

The Kirin Electric Light Co., who as recently as 1920/1 put into service a 500-k.w. extension to their existing engine—this extension being supplied by Andersen, Meyer & Co., and consisting of an International General Electric Co.'s turbo-generator, complete with Worthington condensing equipment and also a Babcock & Wilcox Stirling boiler, together with Babcock & Wilcox superheater, fired by means of a Murphy automatic stoker—this year entered into a further contract for a further extension of 500-k.w., consisting of practically duplicate equipment of that in existence at the present time.

It will be noticed from the illustration the excellent combustion properties of the furnace equipment, as evidenced by the absence of smoke from the stacks, even though the boilers at the time the picture was taken were operating at full load.

The same picture shows the two cooling towers used in conjunction with the condensing equipment, and it is interesting to know that during the winter

months it becomes impossible to use the cooling towers as the water in descending from the top of the tower to the bottom is turned into ice. The water is during some of the winter months simply circulated through the cooling pond and back into the condensers again.

Foochow

The Foochow Electric Light Company have for some little time now had difficulty in meeting the demand for load, and a contract has recently been concluded for supply of the necessary material for a 1,000 k.w. extension to their existing station.

The equipment in the present plant consists of one 500-k.w. and one 1,000-k.w. International General Electric Co.'s turbo-gen-

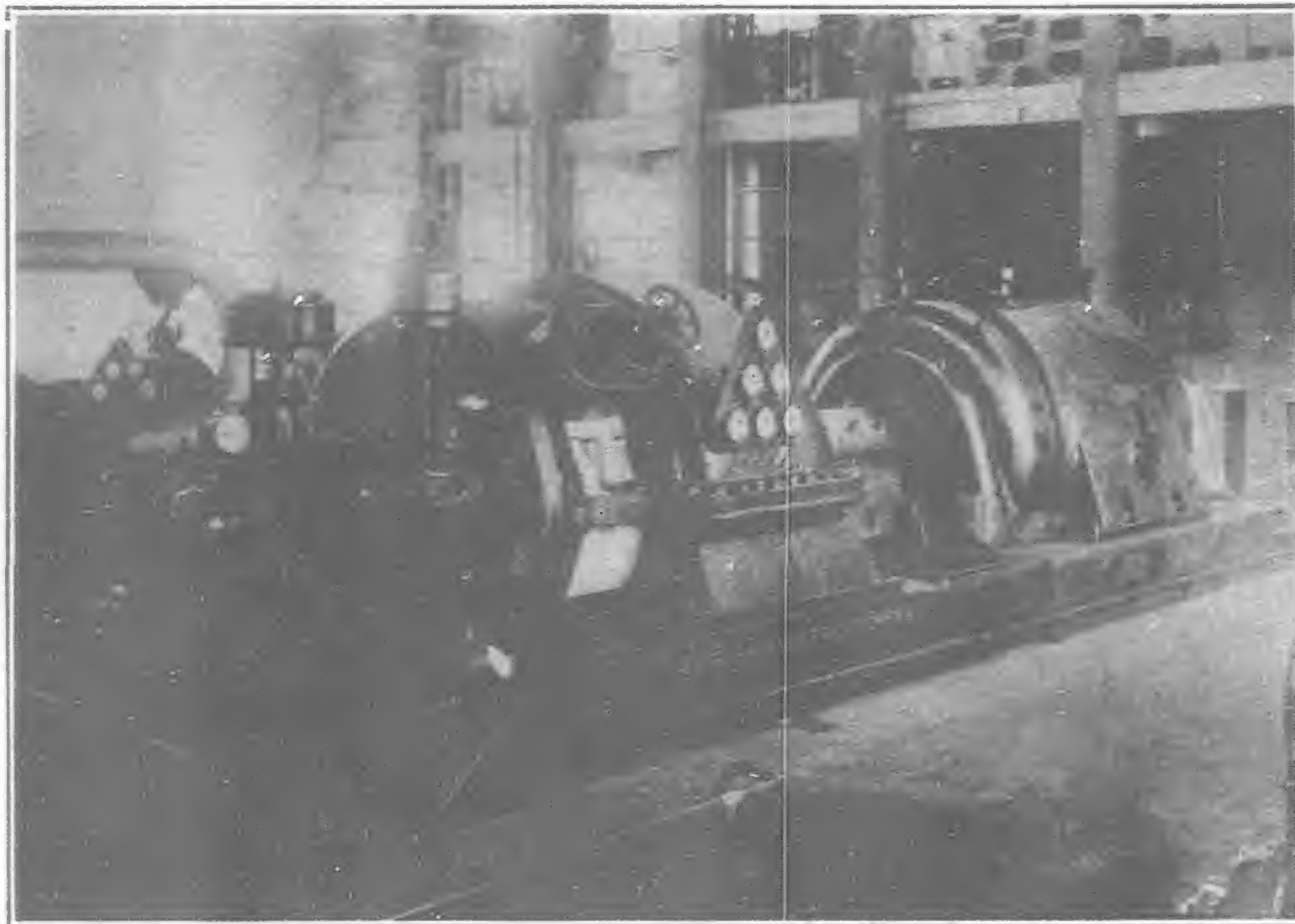
erator, complete with Worthington surface condensing equipment, together with necessary circulating pumps, hot well pumps and Edwards air pumps.

The boiler equipment consists of two Babcock & Wilcox W.I.F. type boilers of 1,218 sq. ft. each and two of 2,531 sq. ft. each, each of these boilers being equipped with a Babcock & Wilcox enclosed chain grate stoker.

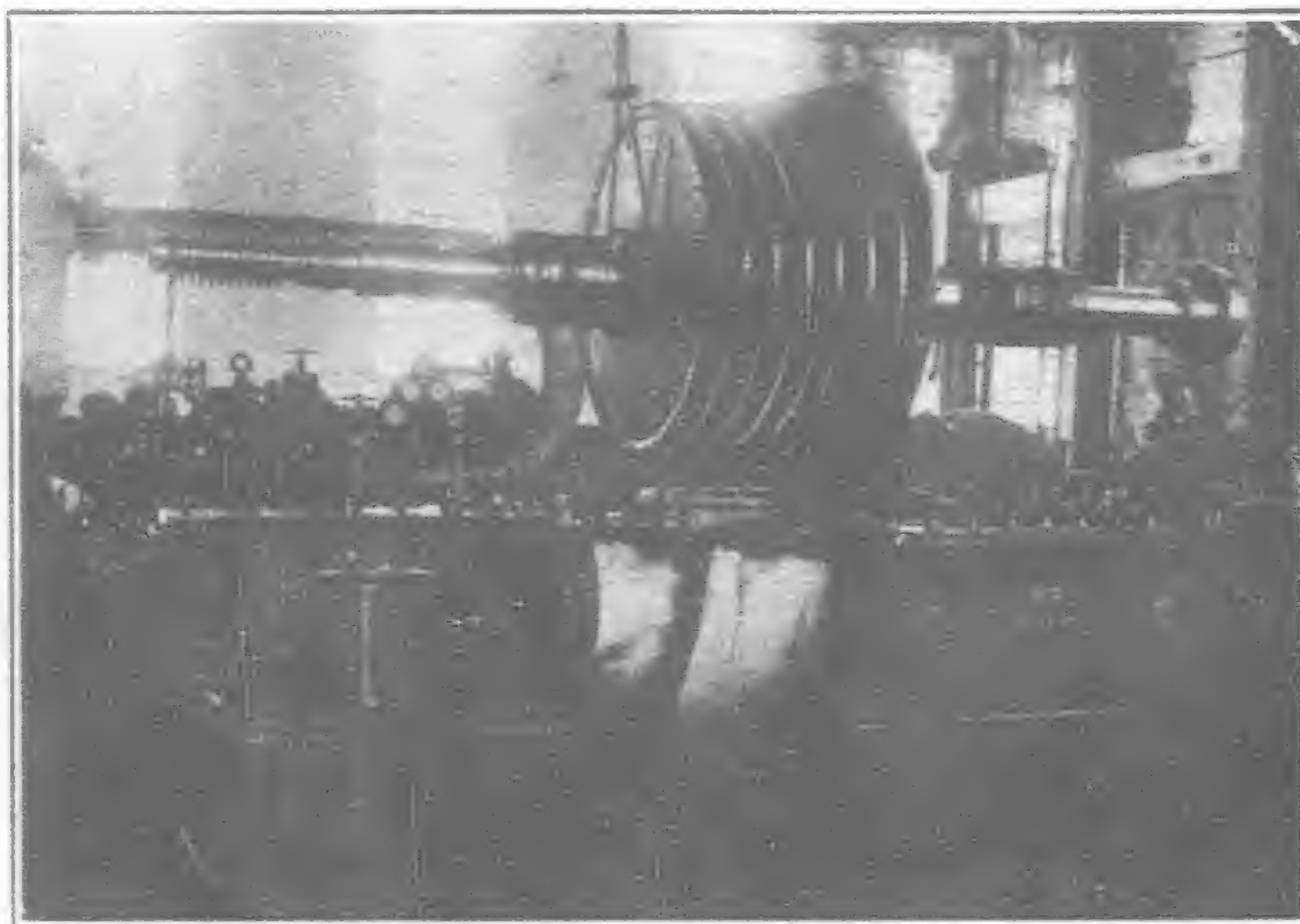
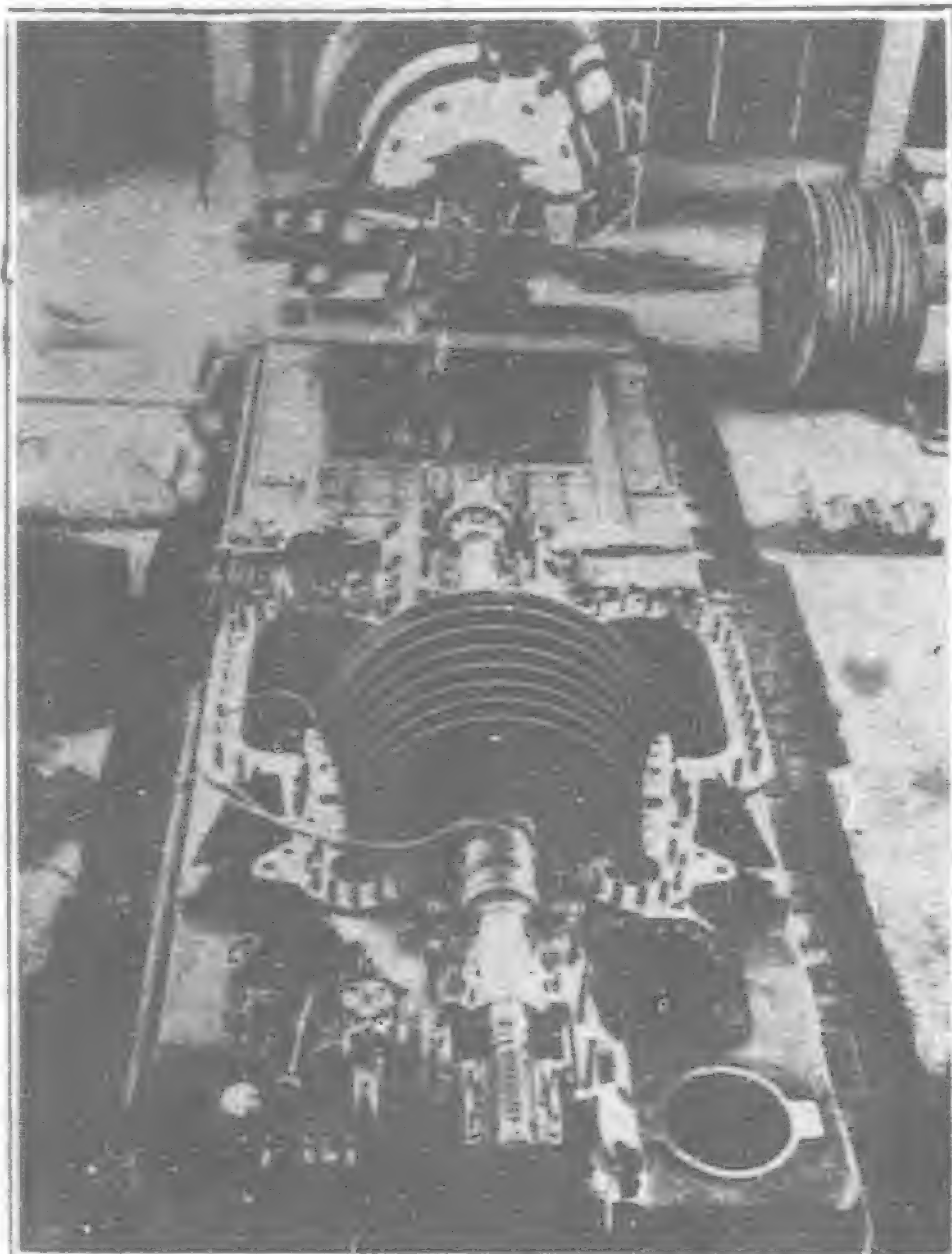
This equipment has proved exceedingly satisfactory for the service it has been used for in the past, but recently it has become necessary for the Foochow Electric Light Co. to use an anthracite coal, and for this reason they have added forced draught under boilers. It speaks highly for the versatility of the chain grate stoker that they have been successful in burning this coal up to the normal rating of the boiler. It has been impossible, however, to obtain any overload capacity from the boilers with this coal.

The extension to this plant consists of the two more Babcock & Wilcox W.I.F. type boilers of 2,531 sq. ft. each, complete with special forced draught stokers manufactured by the Illinois Stoker Co. of America. The stokers introduce a more or less new principle in burning hard coal, and have been thoroughly tried out in other parts of the world, and there is a considerable boiler plant using these stokers now in operation in Manila, P.I.

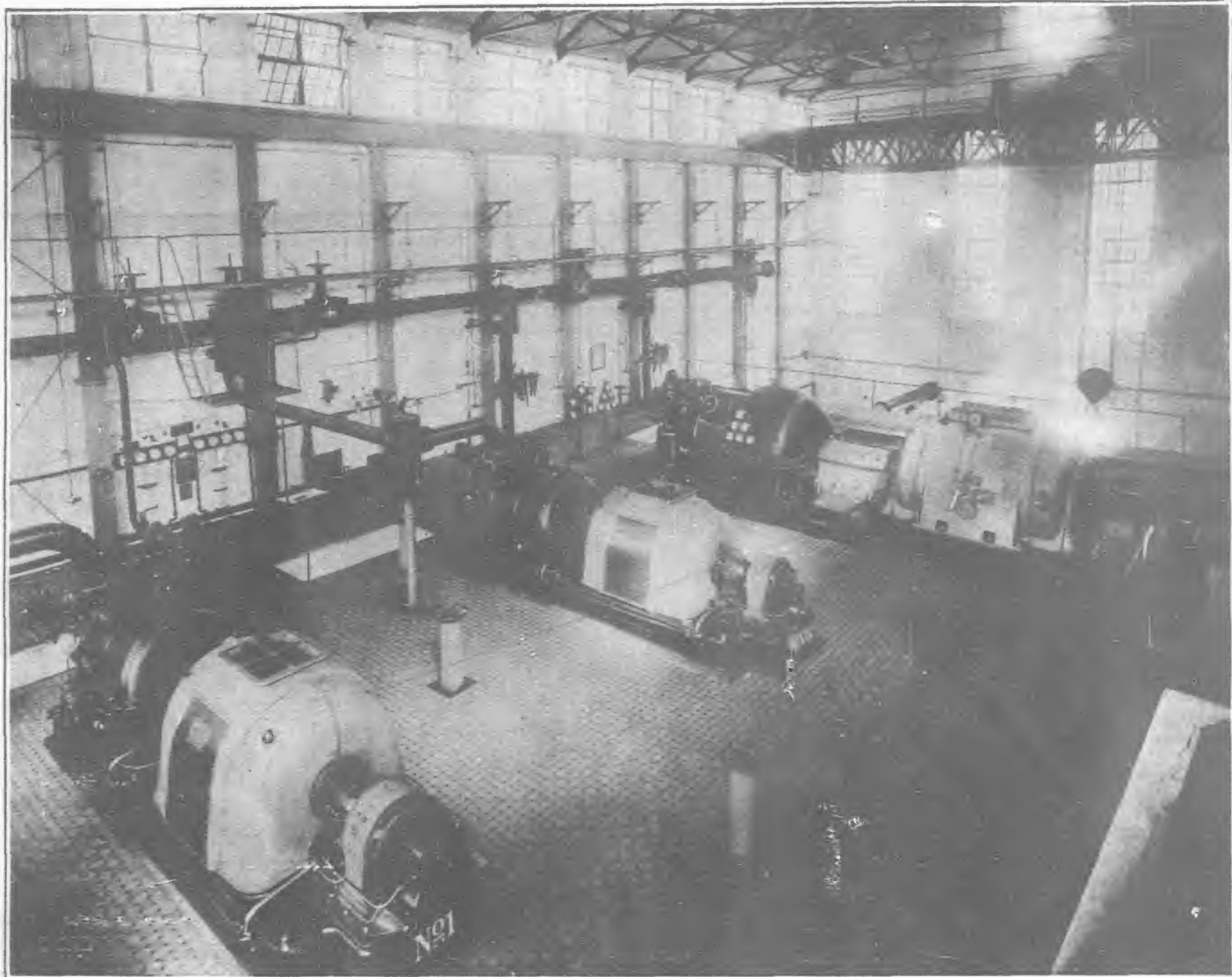
In addition to this boiler equipment the extension will include an International General Electric Co.'s turbo-generator of



One of two 7,500 K.V.A. English Turbo-Alternating Sets supplied to the Hongkong Electric Company.



Views of 7,500 K.V.A. English Electric Turbine for the Hongkong Electric Company during Erection



Hongkong Electric Company: Generating Room

(Jardine, Matheson & Co., Ltd. English Electric Company Installation)

Showing the two original British Thomson-Houston 1,000 k.w. sets, and the first of the 7,500 k.v.a. English Electric Sets. A second 7,500 k.v.a. set has since been installed in the space to the rear of the first set.

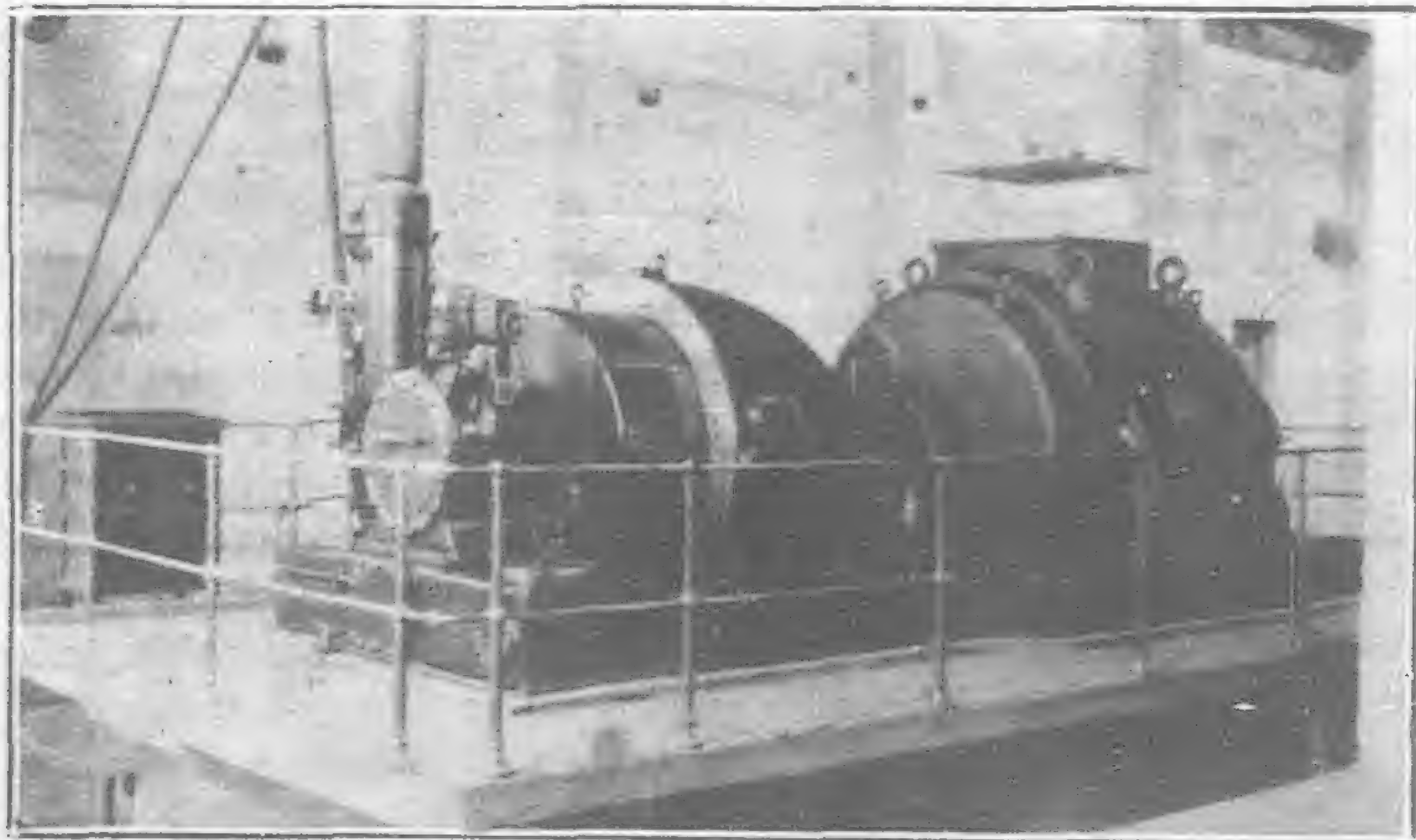
1,000-k.w. capacity, together with necessary controlling switch-board, also, a Worthington surface condenser, complete with hot well pumps, R.D.V. pump and a circulating pump, which will take care of 2,000-k.w. capacity by itself. This latter pump in connection with the pumps already in existence in this station will afford a very flexible circulating water system, which under all conditions of load on the station will be operating at the maximum possible efficiency of pump and motor or turbine drive.

The steam conditions for the boilers at this plant are 160-lbs., and the Babcock & Wilcox superheaters are such as to give a superheat of 120° capacity or more.

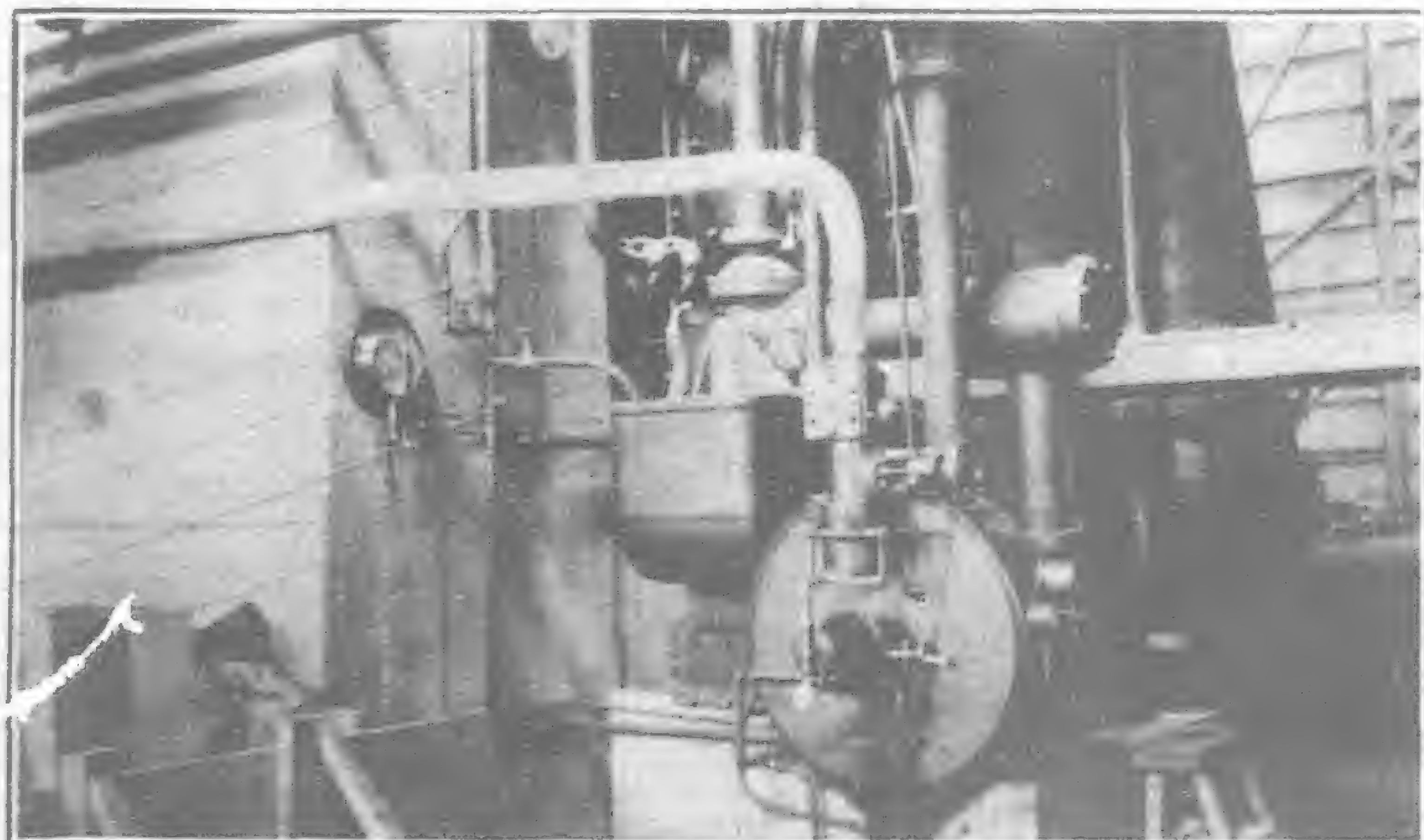
Mukden

Mukden Government Electric Light Works was in the market for extension this year and purchased a complete 3,125 KVA. extension to their present plant. The new equipment consists of one 3,125 K.V.A. International General Electric Co.'s turbo-generator, complete switchboard equipment of International General Electric Co. manufacture.

Two Babcock & Wilcox W.I.F. type water-tube boilers, with superheaters and chain grate stokers, each boiler having 6,182 sq. ft. heating surface of 175-lbs. working pressure per square inch and



English Electric 2,500 k.w. 5,250 volts, 3 phase, 50 cycle, Generator, driven by a Belliss and Morcom Turbine installed at the Mahu Station of the Peking Chinese Electric Light & Power Co.



Bellis and Morcom Condenser at the Mahu Power Station

120° F. superheat. This boiler is equipped with Diamond mechanical soot blowers.

The condensing plant, consisting of surface condenser Worthington Simpson Edwards type wet air pumps, and centrifugal



Stator of 25,000 k.v.a. Turbo-Alternator for Shanghai being loaded into a barge at Manchester Docks, Trafford Swing Bridge—the heaviest lift ever taken here

(Arnhold Brothers "Metrovick" Installation)

circulating are all of Worthington manufacture, as well as the hot valve type boiler feed pumps, tank pump and 2,500 h.p. boiler feed water heater.

The air supplied to the generator is cooled and purified by a Carrier Co.'s air washer and motor control is adopted for the exhaust line connection between the turbine and the surface condenser, and a cooling pond will be constructed to cool the circulating water from the condenser: this pond is equipped with Schutte & Koerting Spray nozzles.

A 25-ton overhead traveling crane is supplied for the turbine room.

The present equipment of this power plant consists of an 1,875 K.V.A. International General Electric Co.'s turbo-generator with complete switch-board, one Babcock & Wilcox

W.I.F. type boiler of 4,020 sq. ft. h.s., 175-lbs. working pressure and 120° F. superheat, equipped with superheater, Babcock & Wilcox chain grate stoker and Diamond soot blowers.

The condensing plant and pumps are all of Worthington manufacture and the type of the pumps are the same as described above.

The 1,875 K.V.A. installation was supplied in 1920, and before this time the plant was operated by three Babcock & Wilcox W.I.F. boilers each of 2,823 sq. ft. h.s., 175-lbs., each equipped with superheater 1,200 and Babcock & Wilcox chain grate stokers. The Diamond soot blowers for these boilers were ordered this year. The generating units were one 500-k.w., one 350-k.w., one 160-k.w. International General Electric Co.'s turbo-sets and one 120 K.V.A. Fairbanks-Morse & Co. direct connected oil engine set.

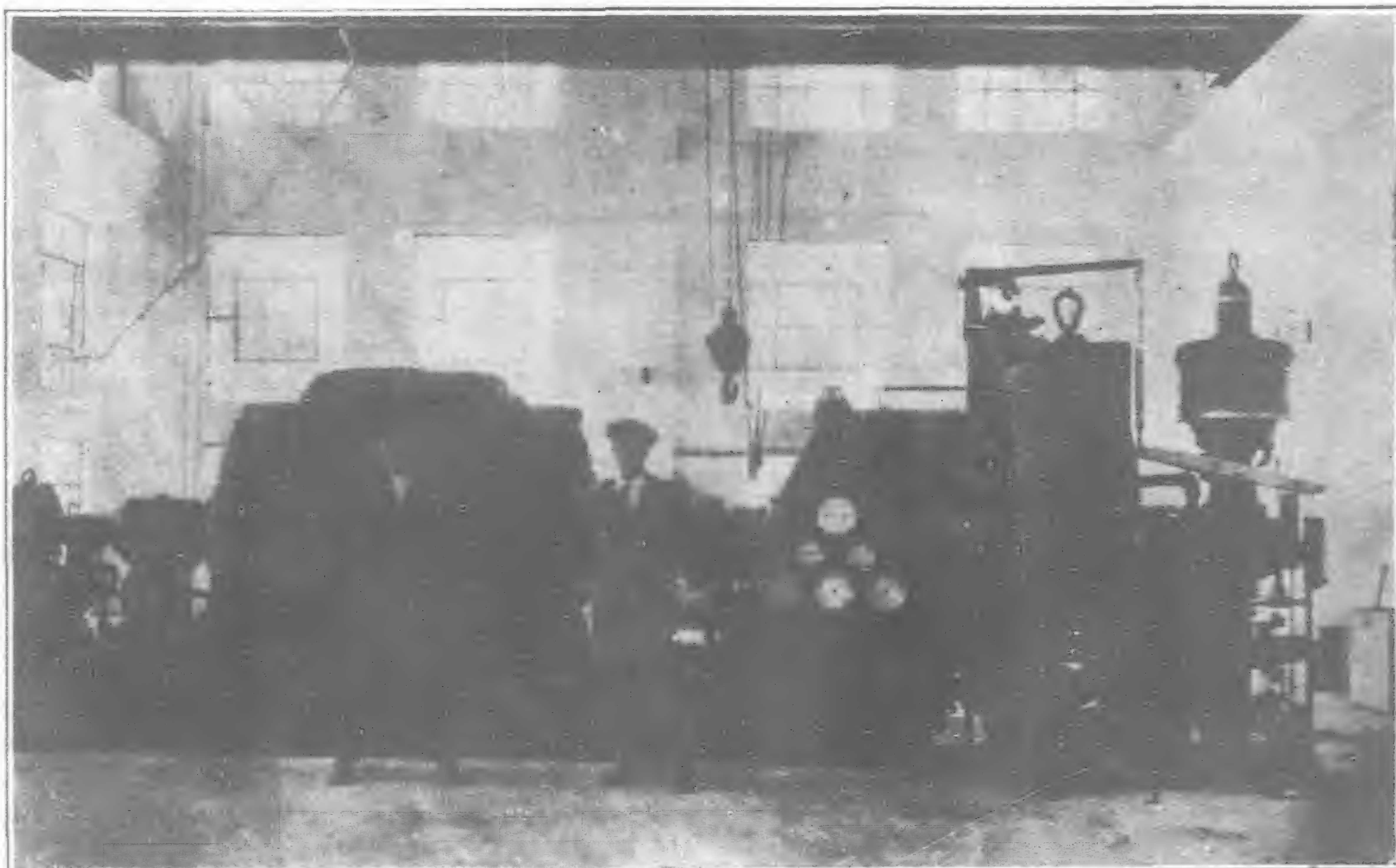
During the year just closing numerous installations have been completed by Andersen, Meyer & Co., in China and some representative pictures are included with this article to illustrate in some degree the magnitude of this work.

Westinghouse Installations in China, 1922

Although comparatively new in the Chinese field with its own organization, the Westinghouse Company has made decided progress, and if installations in Manchuria are added to its credit, it has held its own in the face of keen competition.

One of the most notable power installations completed during the year is that at the Han Yeh Ping & Coal Company's Hanyang plant at Hankow. This comprises a 2,000 k.w. turbo-generator wound for 5,250 volts, 3 phase, 50 cycles and is complete with a direct connected exciter, necessary switching equipment and surface condenser. The switching equipment furnished is rather elaborate as it not only controls the main generating station but also distributes power to three other stations as well as to the distributing house near the wharves, in all of which is installed switchgear applicable for the apparatus operated there. At this plant there are also a number of rotary converters for the changing of alternating current to direct current, thus furnishing necessary power for the direct current mill motors, crane and industrial motors, the latter being of the famous rolled steel frame design.

Across the river from Hankow at Wuchang the Hankow Dee Yee Cotton Spinning Company have this year completed the erection of Westinghouse 1,875 k.w. turbo-generator which has the following characteristics: 3 phase, 400 volts, 50 cycles. This



1,000 k.w. Westinghouse Turbo-Alternating Set, 600 volts, 3 phase, 60 cycles, furnishing power for the Dah Shing Cotton Spinning and Weaving Mill at Shihkiachwang, Chihli Province

(Westinghouse International Installation)

machine has the necessary direct connected exciter and is a duplicate of one previously installed in the same mill. The usual accessories comprising switchboard and condenser have also been installed. The latter is one of the few applications of the jet condenser in China. The addition of this machine, which doubles the capacity of the power plant, enables this mill to furnish power for all the spinning and weaving operations.

At Tientsin, the Yu Ta Spinning Company placed in operation two 750 k.w. Westinghouse turbo-generator units to furnish power for their cotton spinning and weaving factories. These machines are complete with the necessary surface condensers and switchboards, the current being generated at 600 volts, 3 phase, 50 cycles. All the mill machinery is direct driven by individual motors of these characteristics.

One of the quickest pieces of installation work was done at Hangchow, where the Dah Yoh Lee Electric Light Company installed an 800 k.w. turbine in less than two months and had it operating in time to supply the extra power required for lighting the town during the Chinese new year last February. This set was constructed for 5,250 volts, 3 phase, 50 cycles and, as in the other installations mentioned above, the usual accessories were furnished including in this case in addition to condenser and switchboards, the necessary distribution transformers and control panels since this is a high voltage installation.

The Chee Hsin Cement Company purchased and installed at Tongshan a 1,400 K.V.A. turbo-generator set to supply power for the motors and lighting at their cement works. This is one of the few 25-cycle plants in China, the characteristics being 2,200 volts, 3 phase, 25 cycles. The usual exciter, switchboard and condenser were also furnished.

The most recent installation is that at the Dah Shing Cotton Spinning & Weaving Company's mill at Shih Kia Chwang at Chihli. This plant was erected and placed in operation ten months and ten days after the order was entered and this in spite of one month's delay on account of the Chihli-Fengtien war. The turbo-generator was started on September 18 and since that time has been in continuous operation, furnishing power for driving 20,000 spindles of textile machinery, for operating the humidifying system which requires 100 h.p., for running motors for pumping water from underground wells and motors for driving machine shop tools, as well as current for lighting the whole mill. This current is furnished at 600 volts, 3 phase, 60 cycles, which is in accordance with latest



General View of the New Mahu Power Plant of the Peking Chinese Electric Light & Power Company, located 15 miles outside of Peking

standard American practice. The turbine is rated at 1,000 k.w. and is furnished with the usual accessories comprising exciter, switchboard and surface condenser.

The Westinghouse Company have extended to China their policy of having a trained erection engineer present at the startline of their turbine generating units to check the installation and make recommendations as to its care and operation. His services are available at all times for purposes of consultation and inspection.

The Largest Electrical Machine in China

The recent extensions to the plant at the Riverside power station of the Shanghai municipal council will demonstrate the remarkable progress that British manufacturers have made in the China engineering field.

One of the turbo-alternator sets now being installed is the largest electrical machine in China, being rated at 25,000 K.V.A. The complete plant consisting of a turbine, alternator and surface condenser was built by the Metropolitan Vickers Electrical Co., Ltd. at their Trafford Park Works, near Manchester, England.

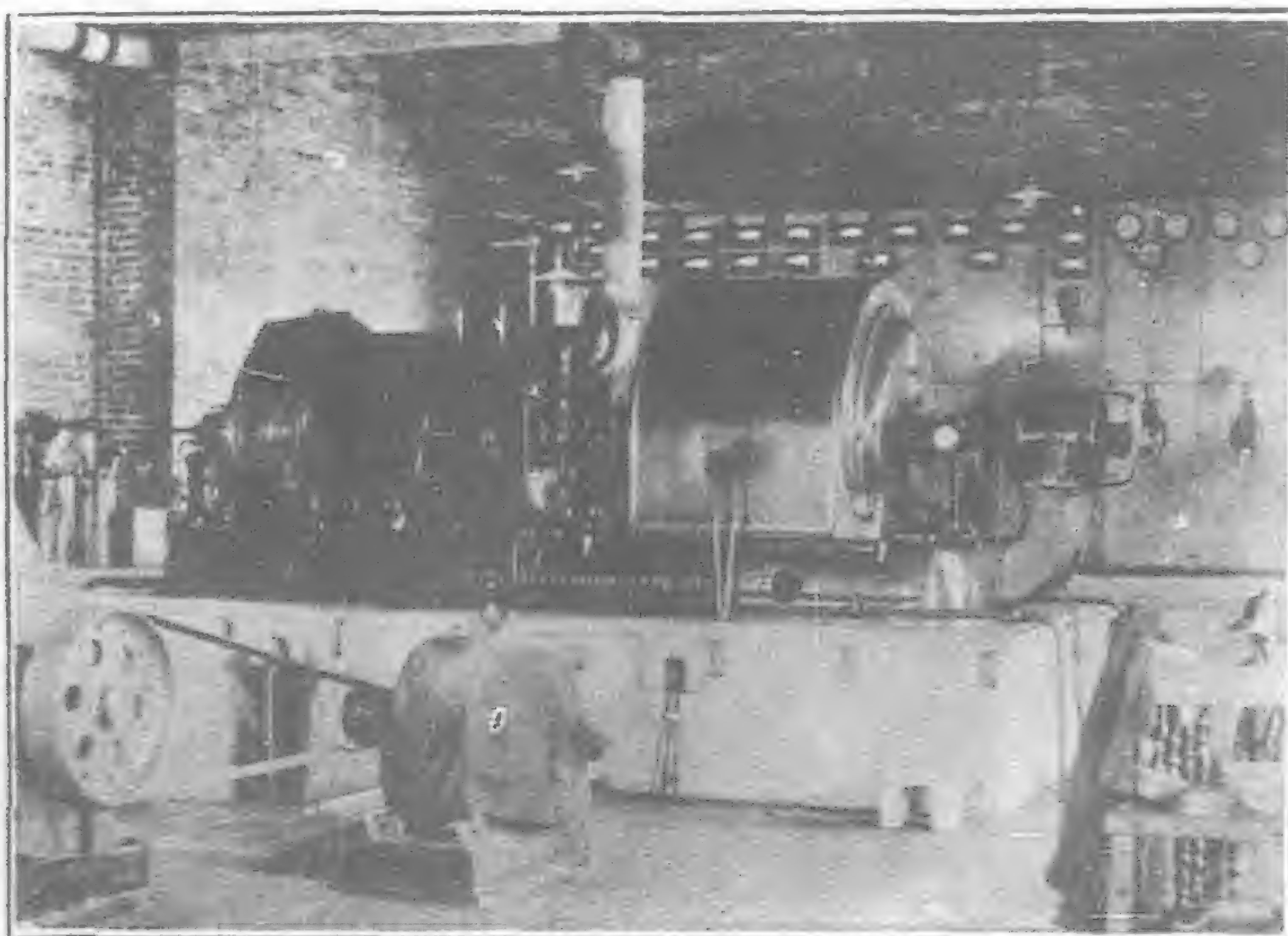
The turbine is of the Rateau type, and turns at 1,500 r.p.m. Its output is equivalent to about 28,000 horse-power, and its steam consumption will be less than 9-lbs. per B.H.P. hour. The alternator is of the enclosed ventilated type, rated at 25,000 K.V.A., 3 phase, 50 periods, 6,600 volts. An interesting feature is the Metropolitan Vickers patent air cooler, by means of which the necessary cool air is supplied to the machine in such a way as to eliminate the possibility of any dirt being drawn in and deposited on the windings.

The ordinary air filter does not exclude all the dust in the air, and if of the wet type is liable to cause damage to the machine owing to moisture being drawn into the windings. With this patent air cooler a very limited quantity of air is used, which not only keeps the machine clean and cool, but also has the advantage of reducing the danger of fire to a minimum, as the small quantity of oxygen would soon be used up. With the ordinary air filter a fire once started, is fed with a constant draught of fresh air and almost certainly results in total destruction.

Another advantage is that the air cooler is placed immediately below the alternator, and the long bulky air ducts usual with a filter, are unnecessary.

The condenser is of the surface type, the total length of tubes being nearly 30 miles. When operating at full duty, the condenser will require a supply of 40,000 gallons of water per minute.

In addition to this big machine at Riverside power station the Metropolitan Vickers Company have also installed two 3,000 k.w. turbo-alternator sets, and three 750 k.w. rotary convertors.



500 k.w. General Electric Turbo-Generator Set and Switchboard of the Foochow Electric Company, Foochow

Hydro-Electric Power in the Netherlands East India

From a paper read before the Royal Institute of Engineers of Batavia, by A. Groothoff

SINCE 1910, when the first director of the department of government industries entered upon his duties, the government began to take the study of the problem of hydraulic power in the archipelago in hand, the purpose in view being in the outset only confined to the future electrification of the state railways, but which was also extended later on to the supplying of a more powerful source of energy as an important factor for the industrial development of the Indies.

Since August 1917 the new service of waterpower and electricity has been detailed to utilize in a practical way the hydraulic energy, now for the greater part still lying dormant in different parts of this island empire, as well in the interest of the state as in that of private industry. The central office of this service is established at Bandoeng and composes three technical divisions, viz., the Division of Electricity, the Building Division and the Hydro-technical Division. The Division E (Electricity) carries out all work, which is to be done in electro-technical lines. The Division B (Building) attends to the building of the government power stations and the task of the Hydro-technical Division comprises the systematic searching for and examination of water powers, the drawing up of an inventory of those powers and the subsequent enlightenment of interested parties, who wish to utilize them. The natural conditions, which everywhere contribute to create important waterpower supplies may be said to be very favorable in these countries.

Amongst the favorable factors should be mentioned:

- The heavy tropical rainfall (which in Java attains an average of from 3,000 to 4,000 m.M. per year, even in more mountainous regions to 8,000 m.M.), which causes, notwithstanding the dry East monsoon, to have, under normal conditions, always sufficient river water at disposition for hydraulic power;
- The large lakes in Sumatra and Central Celebes, the virgin forests in Borneo, as well as the snow and ice-clad summits of the mountains of New Guinea, which all regulate the supply of water to the rivers, are dependent upon those conditions;

- The vertical shape of the large island, causing on the one hand the formation of extensive basins of the rivers with high conveyance figures and on the other hand elevations of ground, which are highly suitable for the development of hydraulic power.

According to a very rough estimate, which does not include the smaller islands and the as yet little-known Dutch part of New

Guinea, the minimum capacity of hydraulic power in the Dutch East amounts to 5,500,000 h.p., viz.:

Java ..	500,000 h.p.
Sumatra ..	2,000,000 h.p.
N. Borneo ..	2,000,000 h.p.
Celebes ..	1,000,000 h.p.

Total .. 5,500,000 h.p.

The regions containing the most water power are West Java (especially the Preanger mountain region), North Sumatra (especially the Asahan region), Central Borneo and the lake territory of Central Celebes.

I. West Java

West Java is the part of the island, containing the most hydraulic power and in this region the utilization of hydraulic power has been the most developed. This applies as well to enterprises undertaken by private persons as by the government. In West Java there are actually large hydraulic power stations being built, which will supply the necessary energy for:

- Electric railways Priok-Batavia-Buitenzorg c.a.;
- different purposes at Batavia and suburbs and at Buitenzorg;
- the general supply of electricity of Bandoeng and the neighborhood of the radio

station at Malabar on the Pengalengan plateau.

For A and B the state hydraulic works are in course of construction in the Tji Anten (Tji=river) near Buitenzorg (28,000 installed h.p.) and near the Tji Tjatih (7,500 h.p.) to the South of the first station is destined to generate the large top-charges of the projected electric railways. For C and D are being built the state hydraulic power station in the Tji Kapoendoeng near Dago (3,000 h.p.) and in the Tji Saroewa, a branch river of the Tji Sangkoej (4,500 h.p.) near Pengalengan.

Furthermore there are also being built two caloric stations, viz., a small auxiliary station of 400 h.p. at Bandoeng (Tji Hapit)



Tjatoer Hydro-Electric Plant in Middle Java

Equipped with 2—1,000 H.P. Francis Spiral turbines; 750 r.p.m. driving 2—800 K.V.A. 6,300 volt, Brown, Boveri Generators.

in order to re-inforce temporarily the already overcharged old station near Dago, and a second station of about 1,000 h.p., South of Bandoeng (Dajeh Kolot) for radio purposes. Both stations may later on co-operate with the four already mentioned hydro-electric stations, when this is necessary during the dry-monsoon.

River basins offering a profusion of hydraulic power should be mentioned in the first place:

1st. The Tji Mandiri territory with an aggregate capacity of 18,600 h.p. on 8 points (the largest energy source has at least 5,000 h.p.),

2nd. The Tji Taroem territory with 43,700 h.p. on 10 points (largest energy source at least 12,500 h.p., viz., to be supplied by

the second Tji Sangkoej hydraulic power station, now being studied).

3rd. The Tji Laki territory with 31,500 h.p. on 4 points (largest energy source at least 15,000 h.p.).

4th. The Tji Manoek territory with 30,100 h.p. on 7 points (largest energy source at least 1,000 h.p.).

In these four territories together there is, thus, a total available hydraulic power aggregate of at least 123,900 h.p. or about one-fourth of the total estimated capacity of the important hydraulic forces above 1,000 h.p. in Java.

The region of the Preanger regencies is the one containing the most hydraulic power of the entire island. Here there are about two-thirds of the total number of hydraulic installations to be found for private enterprises, to wit, about 240 having a total capacity of about 9,000 h.p. as against about 12,000 h.p. in the whole island. It is also very remarkable that nearly 95 per cent. of the hydraulic power energy installed in tea factories has been centralized in the Preanger regencies, with a total capacity of 6,000 h.p.

II. Central Java

Central Java, which comprises the residencies of Pekalongan, Semarang, Banjoemas, Kedoe, Djoejakarta and Soerakarta, is

not so rich in hydraulic power as West Java.

Yet also here various important sources of hydraulic power have been discovered, especially in the Serajoe basin, in the Toentoeng and in some rivers along the North coast. In the Toentoeng 13,000 h.p. have been found to be available, which may be worked

on three or four levels. The most favorable portion of the basin, which is that one in which the Toentang cataracts are situated, has already been given out for exploitation to the A. N. I. E. M. (General Netherlands Indian Electric Company), which company already since 1913 works at that spot a hydro-electric station with an installed capacity of 2,200 kilo-

watts for the supply of electricity to Semarang and Salatiga.

On behalf of the government a project has been drawn up for a larger hydraulic power house on the Toentang river, which may also serve to supply energy to the electrifying of tracks of the Netherlands Indian Railway Company.

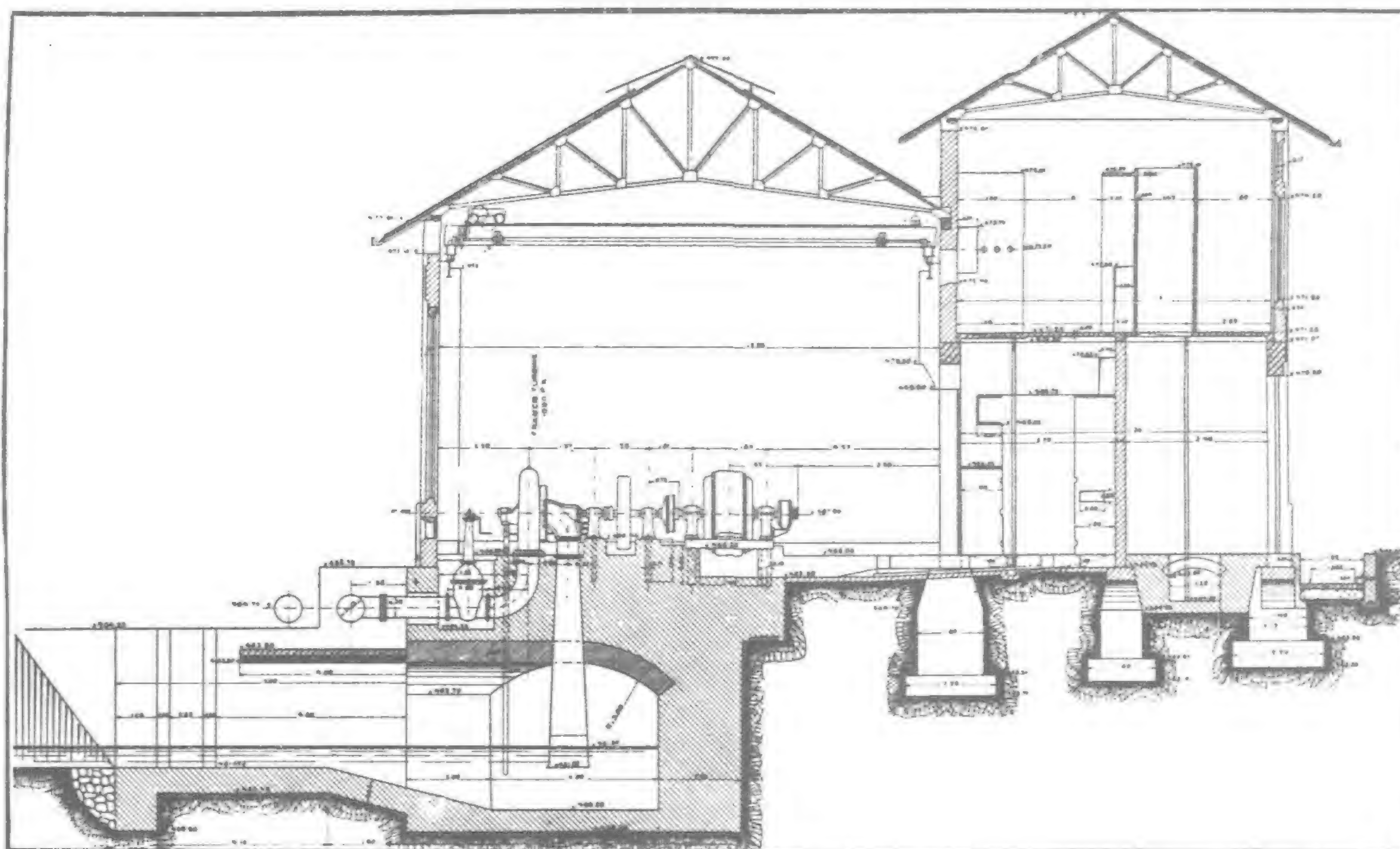
In this river an important amount of hydraulic power is stored, which will become available when constructing the projected

Rawa-Pening reservoir, having a capacity of 237 million cubic metres. When this reservoir will be completed the supply of available river-water will be doubled, which will enable the utilizing of an additional 13,000 h.p. Also the Serajoe river in mid Java may come into consideration as an important source of energy.

III. East Java

In East Java on behalf of the government the smallest number of energy sources has yet been discovered. The smaller hydraulic forces are here pretty

numerous and are being utilized by several estates to get their energy from. But also with regard to the larger hydraulic sources of more than 1,000 h.p., the rivers in East Java are not by far so destitute as many suppose on the strength of climatological factors. Since 1917 the government station in the Tjatoer valley is in exploitation to supply energy to the state railway



Elevation of the Tjatoer Power Plant



Power Plant and Water Observation Station at Tjikapoendoeng, West Java



General View of the Tjatoer Intake

workshops near Madioen. This power station has two turbines of 1,000 h.p. each, operating under a volume of water of 110 m. height. The canal through which the water is supplied has from the *prise d'eau* till the tubes of

the turbines a total length of 2,200 metres, in which there have been constructed two tunnels of respectively 240 and 360 metres length. The electric energy is conveyed under 55,000 volts along an aerial conductor, the latter being 15 k.m. long, rigged on iron masts, to the sub-station at Madioen. Plans have been drawn up for the building of a government-hydraulic power plant along the Kali Konto, with a capacity of 10,000 h.p., destined for the electrification of the state railway lines in and near Sourabaya, and at the same time for the general supply of electricity in the districts of Sourabaya, Kediri and Pasaroean.

The hydraulic forces in the Kapongan main canal are being reserved for general purposes (radio station, pumping up of irrigation water, and the illumination of Sitoebondo).

IV. South Sumatra

The works already completed and the plans being taken in study in South Sumatra may be divided into the following large groups:—

A. The many primitive native water-wheels, which chiefly serve to drive the rice husking mills in Bencoolen;

B. The pretty large hydraulic power plants of the private mining companies and the state-mine Tambang Sawah in Bencoolen. Simau has harnessed 1,300 h.p. on the Ajer Loesang and Ajer Gloemboek, Redjang Lebong disposes of 1,550 h.p. in four plants in the basin of the Ajer Ketahoen and gets its supplementary energy from the state waterpower plant, situated on the shores of the lake

of Tes, in which two aggregates of 1,000 h.p. each have been constructed. This power plant built for the state gold and silver mine has been taken in operation in the beginning of 1920, the building of it having taken three years.

C. The hydraulic power plants for various agricultural estates in Palembang.

D. The plans to utilize power in connection with the following industrial purposes:—

a. for the manufacture of nitrogen, for which purpose concession has been given to draw the water from the Moesi river or from the Ranau lake with a tunnel through the Barisan to the Indian Ocean;

b. for the manufacture of iron in the Lampong districts, for which purpose permission has been asked to draw the water from the Wai Sekampong and the Wai Besai.

For the future the hydraulic forces in South Sumatra represent a considerable reserve for the supply of hydraulic power in Java, which in proportion to its population and future industrial development, is not so very large. The large distances of some hundreds of kilometres will certainly not form a drawback against that time, neither the crossing of Soenda Straits.

V. Mid-Sumatra

For mining and industrial purposes the following hydraulic power plants exist at present:—

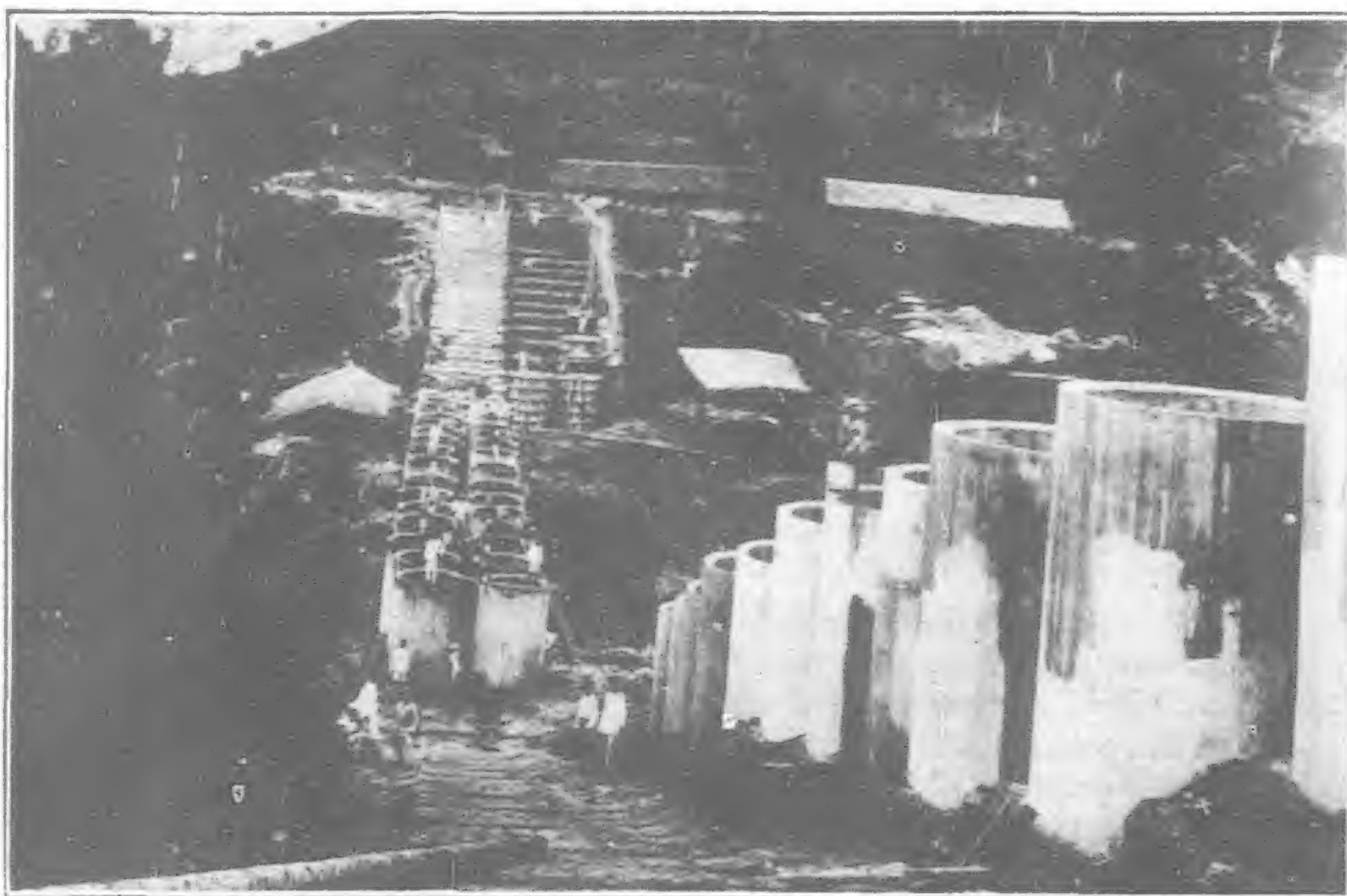
I. A hydraulic power plant of 1,000 h.p. for the mine Tambang Salida on the Salida river;

II. On the Padang river a plant of 1,500 h.p. to supply energy to the Netherlands Indian Portland Cement Factory at Indaroeng;

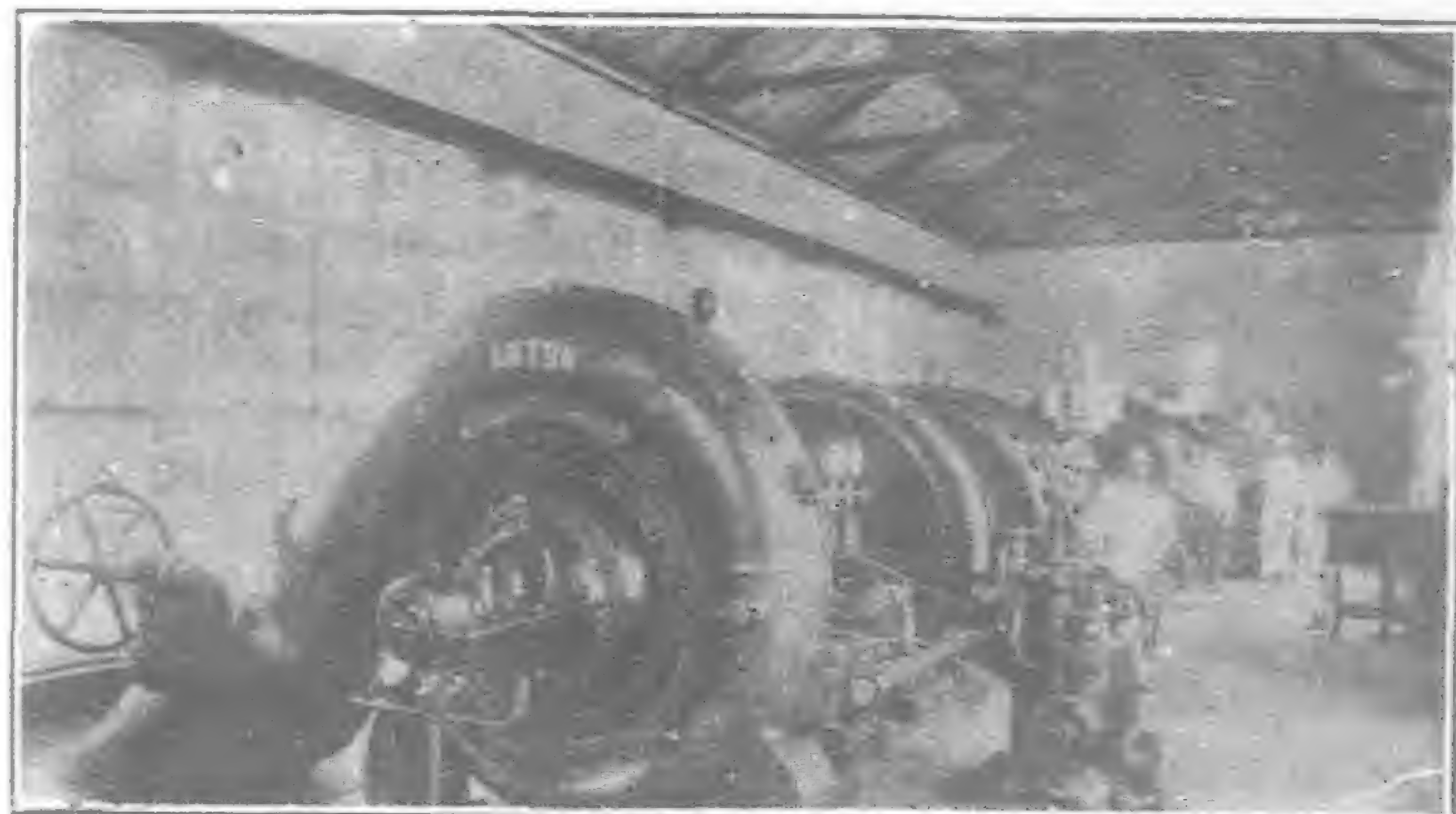
III. A second hydraulic power station for the cement works above mentioned in course of construction on the Koerandji river, having a capacity of about 3,000 h.p.;

IV. Various hydraulic power plants of the Mining Company Equator at Mangani, having an aggregate capacity of about 1,000 h.p.;

V. Three plants of a total of 275 h.p. for the mine Kinandam. On behalf of the government so far the following hydraulic forces have been discovered in these regions:—



Manufacturing Concrete Pipes for the Tjikoeja Syphon of the Tji Tjatit, West Java



Hydro-Electric Power Plant of the Anglo-Dutch Plantations, Ltd.



Autographic Water Stage Register in the Tji Taroen, near Bandoeng, West Java

1. In the Ombilin river 16,000 h.p.;
2. In the Agam river two of 10,000 h.p.;
3. In the Anei river 4000 h.p.

VI. North Sumatra

Of the whole of the islands the most northern part, which comprises the district of Tapanoeli, Sumatra's east coast and Atcheen, contains perhaps most waterpower. On four exploration expeditions, of which three were sent to the Asahan territory and one to the Peusangan river, there have been discovered a total of 800,000 h.p. Also the upper stream basin of the rivers in the territory under cultivation of the east coast of Sumatra contains a profusion of hydraulic power, be it of a more modest capacity.

The great problem in hydraulic power in regard to the east coast of Sumatra is the utilization of the Asahan waterpowers. Along this river (see the four photographs on page 3) which streams from the Toba lake, at least 500,000 h.p. may be harnessed in four consecutive power plants. Of these 200,000 h.p. have been given out in concession in the interest of the building of a factory of nitrogenous manure and other electro-chemical industries. The plans have reached a very advanced stage of preparation and are, according to authorities, very promising.

As far as is known, nowhere else in the Dutch East is such an enormous capacity found close together, within a radius of about 10 k.m., which may be utilized at such low figures as to the costs.

In order to give some idea of the cost price it may be mentioned that the energy, transported at a quantity of from 10,000 to 20,000 h.p., over a distance of about 200 k.m. to the neighborhood of Medan, should at the latter place cost not more than that supplied by the new government hydraulic power plants in the Preanger regencies, viz., a few cents per kilowatt hour.

Also for the future electric railways in the basin of the Toba lake, with its steep slopes, energy will be supplied from the Asahan river, for which purpose already part of the available power has been reserved.

VII. Borneo

Hidden in impenetrable virgin forests far in the interior, gigantic energy forces are stored in the streams of the large rivers Kapoeas, Baritoe, Mahakam (Koetei river) and Kajan, all of which are fed by the inexhaustible equatorial rains of Borneo.

A very small corner of the veil, which covers from sight the enormous quantities of energy lying dormant in those regions, has been lifted in 1918 temporarily only, by the civil engineer A. G. A. van Eelde, who has explored the Bem Brem falls in the Kajan river. Many hundred thousands of h.p. were shown to exist in the basin of the Bem Brem falls, of which to a certain extent, detailed hydrometrical and topographical data have been given. The economical value of these mighty hydraulic powers, though naturally cheap to harness and work, is actually still small on account of the great distance from the coast and the extraordinary difficulties and excessive costs, which the establishment of industries to be



Water Conduit under Tji Leuntja lake dam in construction, West Java

operated by them, entails in such a primitive country as Borneo. On that score the government does not for the time find it necessary to launch upon special hydraulic power investigations in this island.

VIII. Celebes

In Celebes the service of hydraulic power and electricity has made sure of the following hydraulic powers in 1918 and 1919:—

I. Malili Basin.

Total about 150,000 h.p. in four power plants. These powerplants are being reserved for the future development of the iron and nickel industries. The first one is situated in the immediate vicinity of the important Larona iron ore field. The height of the fall is from 15 to 80 metres, and the energy costs approximately 35 Guilders per kw-year.

II. Laa Basin.

Here a minimum of about 50,000 h.p. are waiting to be worked.

III. Posso Basin.

Between the Posso lake and the sea, two energy sources of 100,000 h.p., situated in the Posso lake, have been discovered.

The Minahassa will be soon investigated in view of the possible laying out of electric tramways.

The above survey and figures demonstrate plainly that in regard to hydraulic power the Dutch East may be called a blessed country, the more so because the hydraulic power in general will not cost so much more to work here than in Europe.

And the government as well as private enterprise have all reasons to continue their efforts to utilize the yet dormant hydraulic powers in the archipelago, which, in the future, will certainly raise the prosperity of the native population.

Building in Japan

A new development which has affected Japanese trade very considerably is the ferro-concrete mania. The building of Japanese houses makes a large and continuous demand for wood which cannot be satisfied from Japan's own forests, though cheap wood for house-building from the state forests is one of the promises made by way of a government contribution towards the lowering of prices. For all other purposes than house-building concrete is the fashion, and it is not uncommon to see single-story places being erected with a tiny tower, hoist, and concrete-chute all complete. The new style of building has offered opportunities for foreign enterprise in Japan. The greater part of the work is done throughout by Japanese, but an American firm has done much work in Tokyo and has built the largest structure owned by any foreign concern in Japan—the new office block in Kobe for Messrs. Brunner, Mond & Co. Even more than actual building by foreign firms, foreign architects (American) have supplied plans for the new style of structure. But that is only a passing phase, and the Japanese architects are rapidly taking up this new fashion.

Far Eastern Timbers

I

Some Facts Concerning Their Properties and Commercial Value

By C. A. Middleton Smith, M.Sc., M.I. Mech. E.

(Taikoo Professor and Director of the Engineering Workshops and Laboratories of the University of Hongkong)

HERE are three classes of individuals interested in Far Eastern timbers. They are: (1) the botanists; (2) the commercial men, the vendors, merchants, etc.; (3) those who use the timbers such as the architects and engineers, the furniture makers, owners of match factories and others.

It is from the point of view of the engineer that the subject will now be considered. It may be well to say, at the outset, that there is a scarcity of information concerning the physical properties of many of the Far Eastern woods. It was with the object of obtaining some definite information of use to engineers that the writer has made various tests on Far Eastern timbers during the past four years.

Concerning the woods grown in China there is very little information available. Mr. Woon Young-chun, B.S.F., M.F., professor of dendrology in the college of agriculture and forestry, University of Nanking, recently produced a book entitled "Chinese Economic Trees," which is of interest.

Mr. Woon is under the impression that his is the first book on the subject of important Chinese trees that has been written in any language. It is designed as a text-book for colleges and is written from the point of view of the botanist. It seems to be an excellent beginning. Its chief interest to the engineer lies in the fact that it enables him to trace certain timbers, giving him a rough idea where the woods are to be found in China. There is no data concerning physical properties of timber, but there are statements as to the provinces where the various trees are to be found. It must be confessed that the knowledge of Europeans concerning the forests of China is very limited. The fact that nearly all of the timber used in structural work in South China is imported leads us to suppose that no suitable woods can be obtained in Kwangtung. There are, however, supplies in Kweichow and Kwongse which are but marked.

The profusion of forests in South Eastern Asia has led to various enterprises of a commercial nature. The trees in that part of the world have also been of considerable interest to scientists. During the past ten years a great deal of data has been accumulated but again chiefly from the botanist's point of view. In this connection, praise is due to the governments of the Philippine Islands, British North Borneo and Federated Malay States.

What is now needed is complete data and information concerning the strength of these Far Eastern timbers. In that work some progress has been made during the past few years, but a great deal still remains to be done.

Early Records

It is probable that the first authentic record concerning timbers in the Far East was contributed by a Spanish Jesuit, Father Juan José Delgado. After a residence of forty years in the Philippines, he commenced, in 1751, to write a book. We learn that "he was studious, observant and an excellent critic." The next record also comes from a Spanish priest, one Manuel Blanco, who arrived in the Philippines in 1805. After some years of travel and study in the various islands, he wrote a book "Flora de Filipinas" which he modestly called "the daughter of simple curiosity." It con-

tains a scientific description of more than 1,200 species with full notes about their properties and uses.

We next come to an engineer who afterwards became a professor in the school of forestry in Spain. His name was Sabastian Vidal. He had a distinguished career as an engineer in Spain, studied in Germany, and finally (1871) became inspector-general of the forestry department of the Philippines. He wrote many valuable works the merits of which have been fully acknowledged by botanists. He discovered 100 new species, and he won the affection and respect of those with whom he worked. There is a monument to perpetuate his memory in the Philippines, a fitting recognition of his services to the peoples of those islands. He was a man who may well be remembered with pride as one of the pioneers of science in the Far East.

His brother, Romingo Vidal, also devoted his life to forestry problems of the Philippines. He lost his life through over-work.

Mention should be made of an Englishman, Mr. Henry Brown, who succeeded his brother in the timber business in the Philippines in 1870. He was one of the commercial pioneers.

The American occupation immediately stimulated interest in the Philippine forests. It was soon recognized that American enterprise and capital could be used to exploit the forests of the islands and the new administration did a great deal to encourage lumbermen. In a government publication, dated 1901, it was stated that the forestry bureau in Manila granted licences without fee, for forest products from public lands. The timber was classified into six groups, and the price per cubic foot for the valuation of state timber, varied from 14 cents for the superior group to one cent for the last group. Only the last three groups could be cut for fuel. In the "superior group" there were twelve woods, including yacal.

Finally we come to the work of Dr. Foxworthy. It is probably not too much to say that he has made a more thorough study of the woods and timbers of South Eastern Asia than any other individual.

It is unfortunately difficult to find copies of his various contributions but the writer has in his possession two issued by the government of British North Borneo, department of forestry. One of these is by Dr. Foxworthy (Bulletin No. 1) and is concerned with the timbers of British North Borneo and minor forest products and jungle produce. The second publication is by Dr. Foxworthy, professor of forestry, University of Philippines, and Mr. D. M. Matthews, conservator of forests, British North Borneo. It is bulletin No. 3 and was published in 1917.

Recently the writer has obtained a copy of the "Malayan Science Bulletin" (No. 1 April, 1921) which is a bulky pamphlet on the commercial woods of Malaya, written by Dr. F. W. Foxworthy forest research officer F.M.S.

Thus it will be seen that Dr. Foxworthy has done valuable work in the Philippines, in British North Borneo, and in Malaya.

The government of the Federated Malay States has a forestry department which is doing much useful work. Recently the high commissioner of the Federated Malay States, Sir Laurence Guillemard, expressed the opinion that the forests were one of the great assets of the country, and a source of much potential wealth. He

added that an accurate knowledge of what they contain is essential to their development. There may now be some regrets in Malaya that, not many years ago, tracks of forests were ruthlessly destroyed to make way for rubber estates.

The conservator of forests in British Malaya is Mr. G. E. S. Cubitt who has published some valuable reports and bulletins. It is noticeable that in spite of the present commercial depression in Malaya the government has strengthened the forestry department in its administrative and scientific branches. They employed a number of planters, who were out of work, during the past year; and in this way, the forestry department has been able, not only to explore forests, but to make a trustworthy estimate of the contents by linear enumeration surveys extending to one per cent. of the total area examined. Perak seems to have great timber possibilities and the other states contain large areas of various woods of value.

An important function of this department is to provide advice to consumers about the uses of different woods. Incidentally it may be mentioned that two of the Malayan timbers have been suggested as suitable for golf club shafts. Mr. Davis, a recent American visitor to South China, is sanguine that bamboo will be suitable for these shafts.

It is evident that the demand for commercial timber of all sorts is increasing and that there are experts in Malaya, Borneo and the Philippines ready to co-operate, on behalf of their governments, with those who may wish to use Far Eastern timbers.

It may be mentioned that large quantities of timber are used in southern area as fuel. It is estimated that, in the F.M.S., more than 90 per cent. of the wood consumed is used as firewood, most of it for domestic purposes. Tin mines consumed in 1919 810,000 tons or 4,050,000 cu. ft. of wood as fuel. Railways, rubber factories, brick and lime kilns also used a great deal.

Popular Fallacies with Regard to Timber

There is a general idea abroad that Far Eastern timber are mainly hard and heavy ornamental furniture or cabinet woods. This is probably due to the fact that only ebony, satin wood and other of more valuable species for furniture work have reached the European markets. In actual fact, the largest part of the timber in the Far East is of another family which, although it supplies many valuable hard woods, also supplies the most widely used soft and medium grade woods.

In the past, there has been a great deal of confusion in the use of the common names of the different woods. This is very largely due to the numerous dialects in use in the Far East. Some years ago, when the writer first arrived in the colony he asked a well-known local architect whether he considered a wood called in British North Borneo selangan batu, one with physical properties suitable for use as beams. The architect condemned this wood but spoke very favorably of a wood known locally as yacal. This wood Yacal is a Philippine word and is given to the wood which grows in the Philippines islands. In actual fact, serangagg batu, and yacal are same wood. In Singapore and F.M.S., this wood is called balow or chengal.

Dr. Foxworthy has performed a most valuable service in tabulating the various names of these Far Eastern wood. In the British North Borneo department of forestry, bulletin No. 1 there appears a list of fifty-eight Far Eastern woods with the names by which each is known in British North Borneo, Philippine Islands, Singapore and F.M.S., Dutch Borneo, Sarawak. Some of these woods have entirely different names in these different places. Thus oba, macaasim, kelat, djambu and ubar are the local names of the same wood. Similar instances can be given for other woods. Perhaps it may be well to mention the case of the Philippine wood molave. The five names for these are kuiling papa, molave, leban, heleban and calipapa. This wood molave has a large number of local names in the Philippine Islands.

On this subject, Dr. Foxworthy (*Philippines Journal of Science*, October 1907) has written as follows:—

"A wood is often variously designated on the same or in different provinces and again, several different kinds are frequently found under identical names; for example molave has more than forty different names in the archipelago (Philippines) and this multiplicity for the same wood naturally results in confusion which is very much increased when, as often happens, the same name applies to different woods in different localities. This makes very easy for the unscrupulous dealer to substitute a poor quality for a better.

Physical Properties of Timber

It is much more difficult to state with any degree of exactness the physical properties of any particular timber than it is given the physical properties of other materials used in engineering work, such as steel or cement. The quality of timber is largely influenced by the soil and climate, the age of the tree, the season of felling and the duration of the seasoning process. The vegetable cells, termed wood-fibres, arrange themselves, nearly parallel to the axis of the stem. If a stress is applied to a transverse section, the fibre must be broken across. A stress, if applied to a longitudinal section, separates the fibres from each other. The strength of the fibres determines the strength along the grain, but it is the adhesion of the fibres that determines the strength across the grain. The ratio is by no means constant. In pine wood, for example, the lateral strength is only one-tenth to one-twentieth of the longitudinal strength; but in leaf-wood it is one-sixth to one-fourth. Roughly speaking, the needle-leaved trees ("coniferous" trees) provide soft wood and the broad-leaved trees supply the hard wood. After felling all timbers require to be seasoned, and during this process, the wood shrinks and loses from one-fifth to one-seventh of its weight.

The strength of timber and other physical properties varies so much that it may be as well to quote a summary of about two thousand tests from twenty-six different trees made by the U.S.A. department of agriculture. These tests were made on long leaved pine (*Pinus palustris*). The heaviness in pounds per cubic foot varied between limits of 28 and 64.8. The tensile strength in tons per sq. in. varied between limits of 1.85 and 13.4. The crushing strength varied between limits 2.04 and 4.15 tons per sq. in. The coefficient of bending strength varied between limits of 1.9 and 7.65 tons per sq. in. The shearing strength varied between limits of 0.21 and 0.58 tons per sq. in.

These figures show how very difficult it is to state, with any degree of accuracy, the physical properties of any particular timber. On the other hand, we can accept mean values of a number of tests as a guide for comparative purposes. The variation of these figures only emphasizes the need for making commercial tests on timbers to be used in constructional work.

In this connection, the writer has noticed that he has frequently seen results of tests made on steel and cement used for reinforced concrete work in the Far East, but he has seldom heard of tests on specimens of timber to be used in structural work.

Special Requirements

The most formidable enemy to timber in the Far East is the white ant. It eats through most woods and, it has been asserted, although it is hardly credible, "that even the surface of iron is effected by these insects if left long enough where they are." This quotation is from a book published in London in 1892. "The Philippine Islands" by John Foreman; it would be interesting to know whether there is any real foundation for such a curious assertion, which, it is only fair to add, Foreman was unable to confirm. Experience in the Far East teaches us, however, that white ants are a deadly foe to many woods. If they really take possession of the wood-work of the building not constructed of the best timber, the case is hopeless. Packing cases have been so eaten away that when lifted they fell to pieces. In the University of Hongkong all of the floors, doors, window frames, benches, etc., were made of teakwood. The original electrical wiring was done before the

writer arrived in the colony. It was carried in wood casing, a very common system in Hongkong ten years ago. After a comparatively short time, the white ants attacked these casings in one of the residences. The casing was near to a wooden floor. The white ants did so much damage that the wires were short circuited and the casing burst into flame. Fortunately some one was in the room, or the results would have been most serious. The whole building would have been gutted.

This led to close inspection of the wood casing throughout the University buildings, with the result that steps were at once taken to replace the whole of it. Incidentally it may be mentioned that experience in Hongkong has shown that where possible the best system of wiring is to use porcelain cleats fixed in the walls; where householder object to the appearance of this system lead covered wires are used, but the expense is much greater and there are occasional shorts with such lead covered wiring.

White ants do not seem to be afraid of painted wood. They work under the paint and destroy the wood. They will completely destroy Oregon pine and other pines. They will attack but are not fond of molave (a wood known in Singapore as leban). And, so far as the writer is aware, they will not attack teak-wood, yacal and some other hard woods.

It is said that ants will bore through teak to get at yellow pine. As far as the observations of the writer go these ants will not attack billian.

The white ants reproduce with extraordinary rapidity and grow very fast. These insects live together in large colonies and in a number of their habits resemble true ants. In the tropics, white ants destroy railway sleepers, telegraph poles, beams, joints, floor board, fencing, furniture and in fact, all forms in wood work. Woods may be artificially protected from the ravages of this insect by impregnation with some suitable antiseptic such as creosote.

Beetles will also attack wood and the only remedy is saturation with some noxious fluid. Corrosive sublimate dissolved in spirit wine is recommended.

The ship-worm or toredo is a most serious enemy to piling, boat keels and other wooden articles which are emerged in sea water.

These small animals are such a serious nuisance as to render any but few of the very hard woods useless for piling.

All vegetable substances when divested of life are liable to decay. All woods are not equally affected; some are liable, under the same conditions, to deteriorate more rapidly than others. It is now universally admitted that some process for the preservation of wood is desirable. The use of preventative solutions is increasing, and it is claimed that, in some cases, the life of the wood can be quadrupled by preservative treatment.

There are two kinds of decay, wet-rot and dry-rot. The former takes place in the tree standing and the latter takes place in dead wood. It occurs in confined spaces where the gases evolve, finding it impossible to escape enter into new combinations and produce fungi which derive their nourishment from and thus destroy the wood.

Timber from Siam

Recently the writer has made a number of tests on specimens of Mai-Takien and Mai-Yang timbers from Siam. The various trees from which these timbers were obtained were all grown in sandy and gravelly soil. The specimens of Mai-Takien were of light-brown color. Those of Mai-Yang were of dark brown color.

Twelve specimens of each type of wood were supplied for bending tests and eighty specimens of each type were supplied for compression tests.

A hand-power Avery testing machine was used for the bending tests. All of the specimens tested for bending were rectangular in shape and of dimensions 2-in. by 2-in. by 36-in. The system of loading employed was that known as the "Third Point Loading." The span used was thirty inches.

Deflections during the loading of each specimen were measured and the values for Young's Modulus of elasticity (e) have been calculated.

The compression tests were made on specimens 2-in. by 2-in. by 6-in. In all of the compression tests failure was caused by shear except in the case of four of the Mai-Takien specimens in which failure was caused by splitting. In all cases cardboard pads were used and there was no variation in the system of loading. One of the Mai-Yang specimens supplied for compression tests was accidentally injured and was discarded.

The Results Obtained

It is to be expected that there will be some variation in the results of any tests on timber even if the specimens are taken from the same forest. The average results of several specimens are, however, of value.

The remarks given with the full results of each series of tests give the life-history of the timber, as far as it was possible to obtain this information.

The co-efficient of bending strength (f) was determined from the equation

$$f/wl/bd^2$$

The highest figure recorded for any specimen during the bending tests was 6.19 tons per sq. in. for Mai-Takien. The mean average of the bending tests for all of the 12 Mai-Takien specimens gave a bending stress of 5.380 tons per sq. in. The lowest figure recorded during these tests for Mai-Takien was 4.56 tons per sq. in.

For Mai-Yang the highest figure recorded during the bending tests was 3.86 tons per sq. in. The mean average of 12 specimens of Mai-Yang gave a bending stress of 2.993. The lowest figure recorded for Mai-Yang was 1.89 tons per sq. in. but this specimen was faulty and it is probably fairer to accept the next lowest figure which is 2.34 tons per sq. in.

The results obtained for Mai-Takien were much better than those for Mai-Yang.

For practical purposes, in comparing strength of woods, the figures recorded for the bending tests are those that should be primarily considered. The results obtained for the compression tests are, however, of interest, especially as showing uniformity of strength.

In the compression tests Mai-Takien again gave better results than Mai-Yang.

The highest figure recorded in the compression tests for Mai-Takien was 3.38 tons per sq. in. The lowest figure 2.18 tons per sq. in. The mean average of 80 specimens was 2.89 tons per sq. in. The highest figure recorded in the compression tests for Mai-Yang was 2.12 tons per sq. in. and the lowest figure was 1.04 tons per sq. in. The mean average of 79 specimens was 1.69 tons per sq. in.

(To be continued.)

Batignolles Awarded Siam Locomotive Order

The tenders for the supply of locomotives to the Siamese department of state railways were opened on 15th September, and the results published in October. There were forty-five tenderers in all: Germany (14), England (13), Belgium (7), France (3), United States (2), Italy (2), Switzerland (2), Canada (1), and Holland (1).

The lowest British quotation (f.o.b.) for the supply of six engines was £31,857, and the highest £43,710. Out of thirteen firms tendering, ten asked for £28,000 odd. The lowest German tender was £27,150, which two firms quoted, and the highest £29,109. The American quotation was £40,505, and the Canadian G. \$224,400. Italy's lowest quotation was £30,000 and the highest £54,085. Belgium quoted in francs, her lowest being 1,248,000 and highest 1,539,000.

The tender for ten locomotives and tenders and spare parts has been awarded to Messrs. Societe de Construction des Batignolles of Paris, at the total price of Fr. 2,988,000. The Compagnie Generale Francaise pour la Commerce et l'Industrie are their Bangkok agents. The original price submitted was for Fr. 3,422,000, but the firm was able to reduce the price on their original designs.

NORTH BORNEO

Her Economic Position and Outlook

Illustrated by Photos from Mann Singh, Jesselton

By G. C. Irving

THE position of North Borneo, her constitution and her economic condition render her unique amongst the nations and states in the Far East. The territory is the domain of a company of landlords whose rights and privileges are as jealously guarded by the forces of the crown as though they were actually a part of the British empire. Their affairs are purely of a domestic character and they leave to the British government the protection of their sea routes and the safeguarding of their interests should they in any way clash with those of their neighbors.

The governor of the Straits Settlements enjoys the title of British agent for North Borneo. He takes no active part in the administration or the policy pursued within the state to which, on infrequent occasions, he pays a stately and formal visit. Many of the admirals of the China fleet have taken a personal interest in the fortunes of the country and have paid visits to Sandakan or Jesselton. Admiral Sir Alexander L. Duff recently visited the latter port in H.M.S. *Hawkins* and was greatly interested in what he saw. Finally His Royal Highness the Prince of Wales was pleased to include North Borneo in his wonderful Eastern tour, an honor which set the seal of royal approval upon the enterprise of a private company.

There can be no possible doubt that Great Britain values very highly the British influence which has been established in Northern Borneo.

The granting of the charter was very hotly debated in parliament forty years ago. It was thought by many that a small independent state, calling for protection, might bring upon the government more trouble and expense than it was worth. Actually the government's bill must be a very small one indeed. On two occasions North Borneo has been given the assistance of a warship to deal with local rebellions but beyond that she can have given little or no anxiety to the parent nation.

Her position to-day is one of such complete security within and without her borders that she can begin to study the problem of her economic expansion.

Twenty years or more ago when the writer first came to the country, the government's attention was centred

upon native affairs. More or less unknown districts were being opened up, courts of justice established and legislation introduced to meet with emergencies and conditions as they arose and were developed. In the wake of the district officer came the Chinese trader who pushed farther and farther inland as stable conditions expanded.

European capital began to creep in, attracted by the richness of the soil and the immense stores of timber in the forests. Though progress has been slow it has been most emphatically sure. In

1900 our imports were valued at £337,761 and our exports at £353,453 whilst in 1920 they were respectively £1,284,438 and £1,405,771. A second comparison of interest is that between the census of 1911 which placed the population at 208,183 and that of 1921 at 258,355, another proof of progress slow though it may be for a country which relies to so great an extent as this does on immigration to improve its fortunes. Those are but puny figures when placed alongside those

of any moderate sized city, but they tell their own tale of how a handful of pioneers, without spectacular resources in the way of capital, can build on such slender foundations and organization complete in administrative detail and adequately equipped for the economic progress of the country. With but a paltry quarter of a million souls, the majority of whom are concerned solely with the cultivation of foodstuffs it is a sign of great promise

that surplus production for export should amount to over \$10,000,000 a year. For much of this we have to thank European capital which has exploited our forests, planted our rubber and tobacco estates and developed our coal mine. Communications, of which we shall treat in another article, are in the early stages of development. Thousands upon thousands of acres remain untouched, the secret fastnesses of the wild life of the country. Docked behind the forbidding walls of jungle or buried beneath the massive mountain ranges may be, and probably are resources of which we dream but still know comparatively nothing. Geologically the greater part of the country is a sealed book; samples have been found and assayed of gold, copper, manganese iron and even diamonds. Oil there must be because our neighbors of



The Port of Jesselton



Wireless Station at Kudat, B.N. Borneo



Offices of Harrison & Crosfield (Borneo), Ltd. at Sandakan



Loading Bunker Coal at Sobotik, B.N.B.

Sarawak and Dutch Borneo are enjoying the profits of wells the like of which we may yet live to see enrich the country. For the time being we must content ourselves with such exports as we have. We can be satisfied that all are based on sound economic principles. Nothing nowadays is over capitalised. Our Chinese do their business on a system of credits all their own, cajoling and almost bribing the natives to make long journeys into the forests in search of rattan and damar. Of late years the Chinese have done the country an immense service by investing their profits in coconut and rubber gardens. To such an extent has the development of such lands progressed that the government has created a well staffed agricultural and forest department of which Mr. D. D. Wood, an American citizen, is the director. Our European companies are for the moment starved of capital. Money is expensive and conditions must become a great deal easier before we can expect investors to turn their attention to so out-of-the-way a corner of the globe as Borneo.

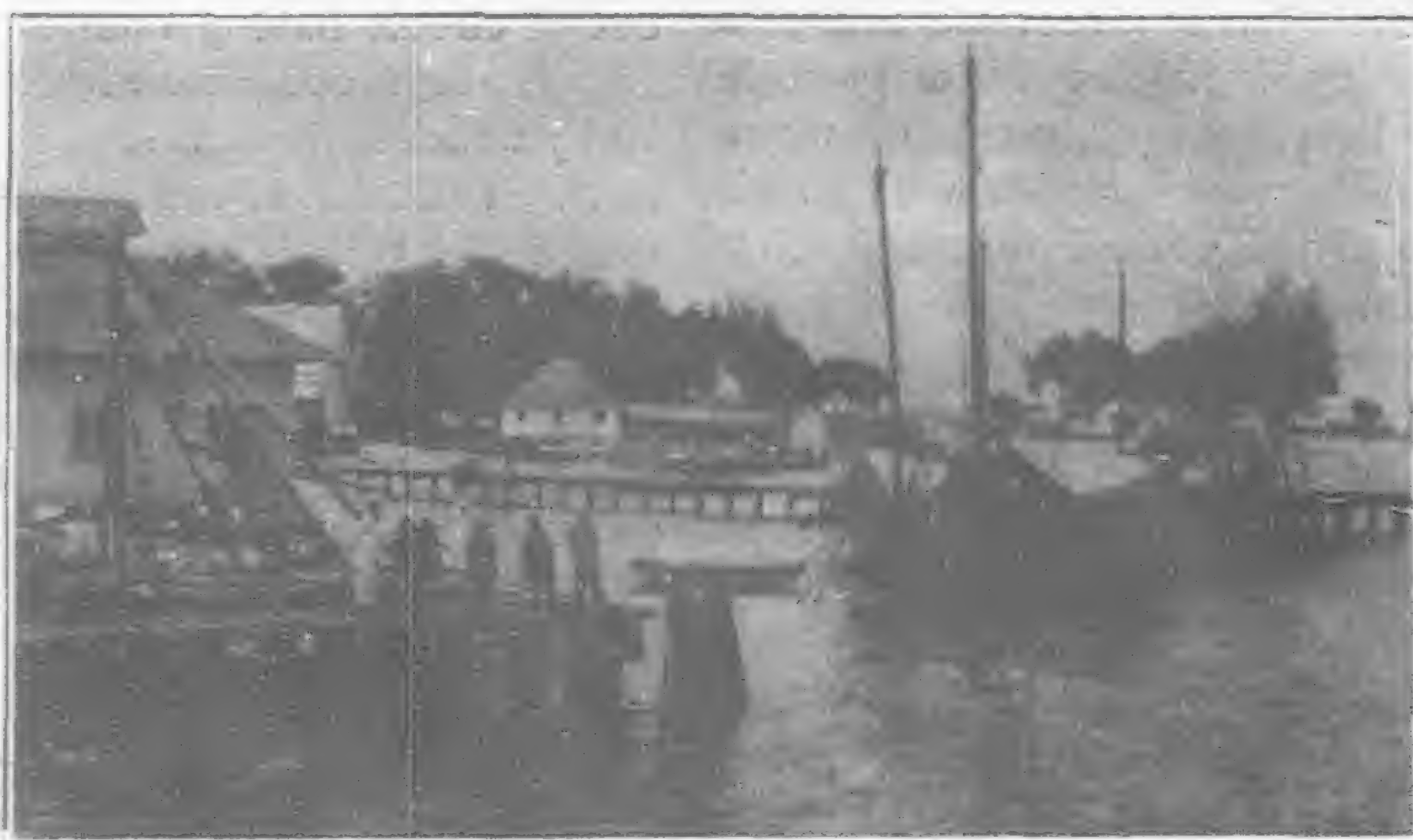
During the rubber boom we were so well in the limelight, with our ideal soil and climatic conditions that £3,500,000 of capital was attracted to our shores. It is a startling proof of the suitability of the country for rubber growing that at the close of the long-drawn-out slump but one minor company has succumbed to the want of the sinews of war.

In agriculture, obviously our leading industry the future is more or less assured. With 50,000 acres of rubber planted and the market of the future a matter of the gravest uncertainty, one cannot look forward to any great increase in planting. With

coconuts it is a different question altogether and we have every reason to foresee a natural and ever increasing development in so sound an investment. Progress in coconut planting has been so rapid that since 1914 the planted area has increased 100 per cent. to nearly 30,000 acres. On the East coast alone these thousands could easily be converted into millions of acres as there is no lack of ideal land with inexpensive transport facilities. It is not for us to dream of expansion such as this but to be grateful for every acre rescued from the wild and turned into a profitable plantation.

Coffee, once a promising and profitable cultivation, cannot at present be grown in competition with Java and other countries. Tea would certainly do well but will not be seen in Borneo until the population increases enormously and labor can be hired at rates which make tea plantations profitable. Both Manila and Sisal hemp find conditions in Borneo entirely to their liking but have not yet been proved to offer sufficiently attractive profits. Many of our natural products have been handled only in small quantities and

some not at all. From all our boundless Nipah Palm swamps not one gallon of alcohol nor a pound of sugar go to provide the wants of mankind. The easy going native cuts, here and there, a few of the waving leaves of the palm to thatch the typical Borneo house. The alcohol and the sugar continue year in and year out neglected if not forgotten. Two comparatively small companies are engaged in cutting and exporting timber. They work upon the fringe of forests that stretch in an unbroken line from the Dutch Borneo to the northernmost point of the island. The forests of Borneo are its



The Port of Kudat, B.N.B.



A Dusun Harrow at Work in Rice Field, after a Rain



Muruts, A tribe of the Interior, B.N.B.

greatest known wealth. Modern machinery and equipment are gradually replacing the primitive methods of our pioneer companies but even they have made but slight inroads into the jungle. The subject is one to be treated in a special article in which it is intended to give more detailed information of what can and possibly will develop in the timber trade. Under the same heading can reference be made to the extraction of cutch from the mangrove forests. This again is an industry with boundless possibilities but dependent to such an extent on the world's markets that further capitalisation cannot be expected for some time. The introduction of cheaper means of production may revolutionise this business which, if other by-products from the bark and tree could be made use of, would offer more attraction to investors than the rather uncertain returns from the cutch markets of the day.

North Borneo has often been described as the grave of disappointed hopes. The traces of abandoned plantations are to be found in many places. The cause of such failures has not been the fault of the country, its climate or its productivity. The opening of any estate or plantation incurring expense in the importation of labor, the building of houses and the clearing of the forest entails heavy capital costs. A fall in the market at a critical time may leave a company or individual planter stranded for want of money to carry on.

With the exception of the Cowie Harbor Coal Company's mine at Silimpopon there is no active mining in the country. Prospectors and geologists have at times made expeditions from which great results were expected but from which nothing concrete has yet been produced. This is not to say that North Borneo is barren of minerals or oil. Geological surveys are so costly that it has not been possible to find the money for the purpose. People are inclined to draw the conclusion that nothing will ever be discovered, a view with which we disagree and will not accept until the geological examination of the territory has been undertaken.

How is the chartered company preparing to develop all the resources of their territory? The building up of the government and trade of North Borneo has been gradual, the work of patient endeavor, not the result of vast out-pourings of capital. To have burdened a young country like this with a crushing debt would have been and would still be a suicidal policy. Particularly at the present time the company sternly refuses to commit itself to heavy capital outlay. It is ready to meet commercial expansion halfway should our trade begin to show renewed signs of life. Filed away ready for action are plans for increased docking accommodation in Sandakan and Jesselton, waterworks, reclamations and roads. A year ago it was thought that the time had come to force the pace but the trade conditions of 1921 and 1922 have had the effect of bringing a heavy hand on to the brake.

The foundation of North Borneo's future lies in the census returns. Our native population, now completely domesticated, is becoming better equipped and more intelligent as our influence is felt. There are no obstacles to a gradual increase of immigration for which we can draw upon China, Java and the Philippines. In a previous paper we showed that Borneo is suitable for Chinese colonization; it is equally so for Philippines and Japanese.

As we stand to-day with our present population and our rate of increase one of 25 per cent. in ten years, there is no hope of our taking anything but a negligible position in the economic progress of the Far East. We are even in danger of a set-back if the country be swept again as it was in 1905 by an epidemic. The normal reproduction of the native tribes is slow owing to the heavy rate of infant mortality. Chinese settlers have large families and are a great asset but their numbers are too small for their increase to have much effect. Probably our best asset is the fact that we can afford to wait. If we are contented to live on our limited resources we can, as a country enjoy a moderate income and let progress come our way but if we intend to take a hand in the game of competition we must find means of supplying the money to do so.

The government is urged by interested parties to spend money on big engineering schemes, there are others who would rather see £10,000 spent on immigration than £100,000 on works which in

themselves are not productive of profit however much they may benefit those who enjoy them. One thing is certain and that is that our cash resources are not enough to do both, at least not to any appreciable extent. Major Owen Rutter, the author of a work entitled "British North Borneo" predicts that great changes will take place within the ten years. What those changes are to be it is a little difficult to prophesy. If they are to take the shape of developing some of our natural resources we may look forward to prosperous years and the growing respect and admiration of neighboring countries.

Chinese Student Invents Smallest Super-Receiver

The smallest super-regenerating receiver in existence has recently been completed by Wei Yoh-wu, a Chinese student who is taking a post-graduate course in physics at Columbia University. This remarkable piece of apparatus is contained in a cabinet measuring twelve by eight inches and six inches deep.

Within this small space Mr. Wei has succeeded in placing a two-tube super-regenerator with two stages of audio frequency amplification, the entire set comprising four vacuum tubes. Another remarkable feature is the system of switches which he has included in such manner that he can, at will, transform the circuit from a super-regenerator into the ordinary type of regenerative circuit. The switch system also includes arrangements to bring in as many tubes as are required, those tubes which are switched out of circuit having their filament current cut off automatically.

The set is complete within itself. It has a loop aerial measuring 10 by 6 inches wired into the lid, there being eighteen turns of wire in it. Variation of the inductive relationship between the primary and tickler coils is obtained in a very novel manner. The former is wound in a little panel which is hinged to the left side of the cabinet. A knob working a geared wheel, which is held in place by a spring, controls the movement of this panel, and thus permits the necessary tuning by means of varying the coupling between the two coils.

The radio frequency amplification unit is contained in a compartment on the right side of the cabinet, which measures three inches in width. The two tubes, the transformers and the switches are built into this compartment with the greatest possible economy of space. The front panel is bakelite and carries nine control knobs.

The U. V. 201 type of tube is used in the four sockets. Only 45 volts pressure is used on the plate of each of these four tubes. With this receiver in the Columbia University radio laboratory Mr. Wei has received the concerts from Atlanta, Ga.; Detroit, Mich.; Pittsburgh, Chicago and several other stations, the energy in each case being picked up on the ten-inch loop only.

In an office, located on the fifteenth floor of a steel constructed building, signals loud enough to be reproduced on a loud speaker were picked up by the tiny receiver from WOR and WJZ, eighteen miles away, despite the fact that the building is one of the worst shielded places in New York City. Only 45 volts were used on the plates of the tubes in these tests.

The normal wave-length range of the set when switched over to a plain regenerative circuit is 200 to 1,000 metres. By means of specially placed binding posts however, loading coils can be inserted in the circuit and the range increased to 25,000 metres without any loss of efficiency.

It took Mr. Wei two months to construct this wonderful set, working only in his spare time at his apartment, 541 West 124th Street. The workmanship is remarkable considering the fact that he had no adequate tools at his command.

Every detail of the set was carefully planned and executed. In the lid of the cabinet, where the loop aerial is wound, there is a schematic diagram of the circuit employed carefully drawn and then pasted to the lid. This diagram contains the constants of every piece of apparatus in the set. The control knobs on the front are all indicated with neatly engraved titled and gradations shown as a guidance in tuning. Mr. Wei was born in Honan, China.

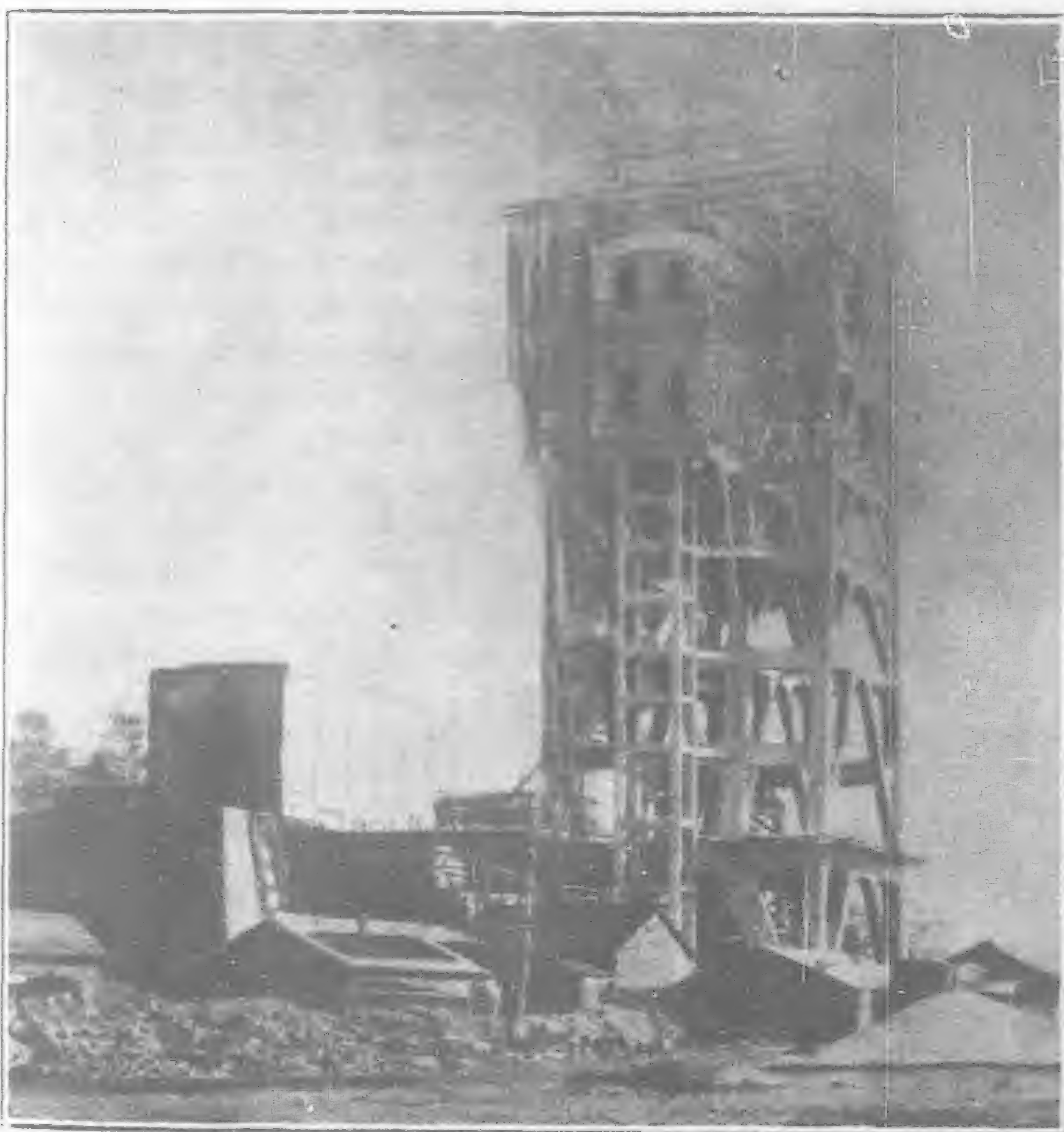
Japan's Great Coal Mines

1. The Miike Collieries of the Mitsui Mining Company

THE greatest coal mine field in Japan is situated in the island of Kyushu, about ninety miles south of Moji on the main line of the Kyushu railway, some 2½ miles from Omita station. According to the report of the Mitsui Mining Co., which owns the mines, at the end of November 1921, the working area was then 50,445,967 *tsubo* (*tsubo*=36 sq. ft.)

There are six pits in operation in this mine field which is known as the Miiké district.

Name	Diameter of Pit Mouth Feet	Depth of vertical Pit Feet	Length Feet	Galleries Width Feet	Height Feet
			No. 1 2,200	13	9.5
Oura ..	10	—	No. 2 2,400	13	9.5
Miyanoura ..	12	176	9,600	18.8	9.1
Katsutachi ..	12	391	6,100	15	10
Miyanohara .	23	468	3,000	15.5	10
Nanaura ..	14	237	2,900	16	9.7
Manda ..	12	896	9,000	16	9.7



Reinforced Concrete Head Frame at the Yotsuyama Pit of the Miike Collieries of the Mitsui Mining Company

The Seam

Altogether there are eight seams found in this field. The first seam is the most important, its average thickness being ten feet, increasing in places to 25 feet. The coal in this seam is free from any shale or stone, and it is from this seam that the "Miiké Coal," famous all over the Far East, is mined.

The second seam runs at a depth of 8 to 10-ft. below the first seam which is called the "Hasshaku So." This second seam averages only about 5-ft. in thickness. Surveys show that this seam is found in all parts of the field and outcroppings are found in many places, especially about the Oura pit. These two seams are the only seams which are at present mined, the others all being



A Pit Mouth of the Miike Collieries

of minor, or little commercial importance. However, with the object of reaching the lower seam of the Manda pit, which lies mainly under the sea-bottom, a new vertical pit was begun in April, 1918, and in May, 1920 had been sunk a depth of 1,348 feet. Since then preparation for mining has been carried out, both inside and outside the pit. The pit is round in shape, with an inner diameter of 23-ft. Its inside wall is built up with concrete and brick. It is intended to sink this pit to a depth of 1,800 feet, reaching the coal by horizontal galleries by piercing rock-seams so as to reach the deeper coal levels.

Miiké coal is light brown in color, and it has a high thermal value producing ample gas. As its moisture content is low it is particularly suited for boiler use, as well as for the manufacture of gas and coke. Miiké coal has no rival in Japan for use as a smithy coal. An analysis of the "Hasshaku So" coal shows:

Water	0.350
Volatile matter	40.100
Coke	53.217
Ash	6.333
Sulphur	2.285
Calories	8.140
Specific gravity	1.275



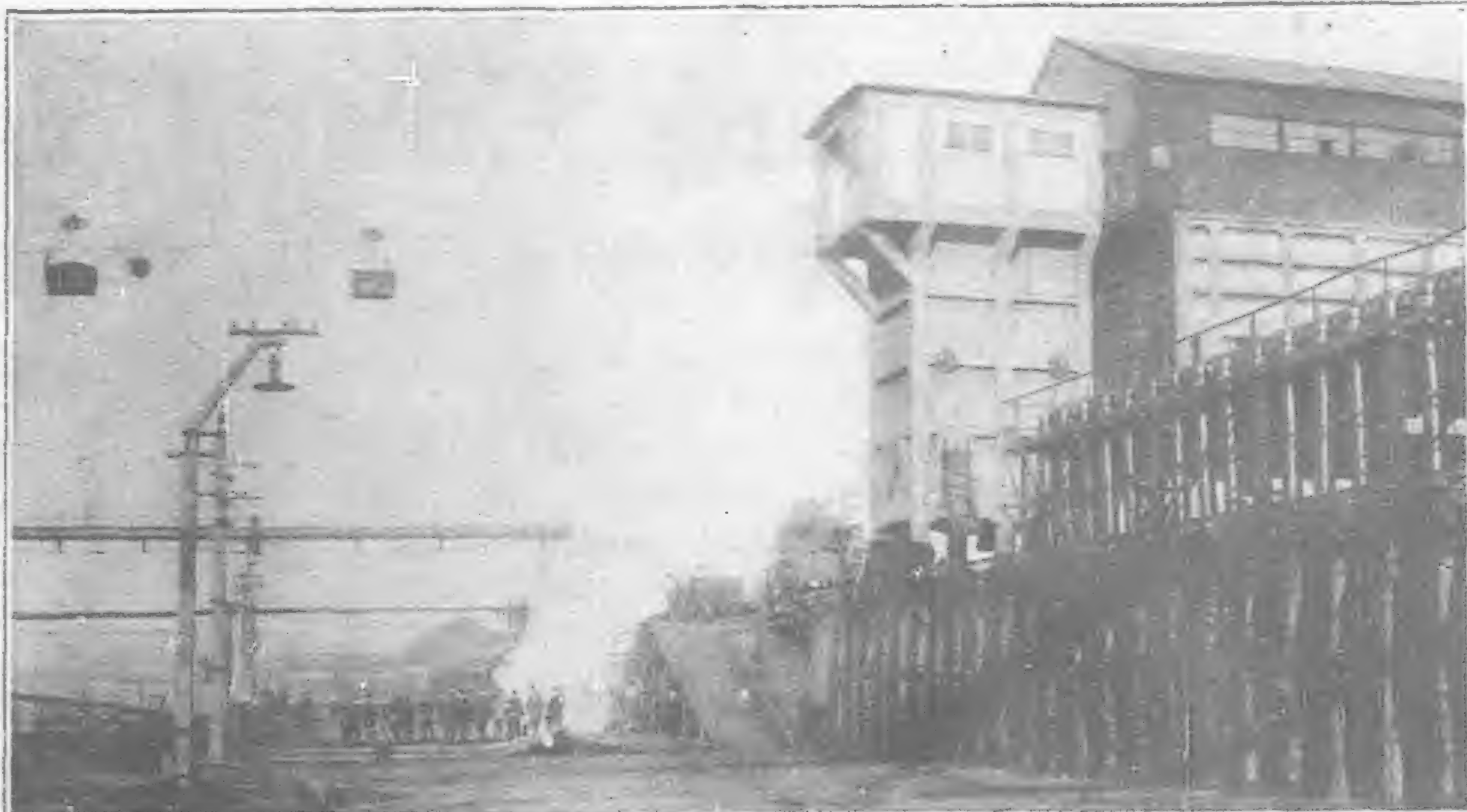
At Work in a Miike Pit

Its great steaming power owing to its high heating value and the uniform quality of the coal, have won for it the reputation of being the standard coal in the Asiatic markets. The average evaporative value of one pound of the lump coal is 9.72 pounds of water at the boiling point. This coal is particularly suited for forging purposes, and commands a wide sale at home and in China for such uses. Miiké coal cokes easily, and coke of excellent quality is made in "Kopper's" regenerative coke-ovens with a by-product recovery plant, of direct process, which is installed at the colliery. The average results of such reduction are:

Per ton of Miiké Coal.

Coke	1,500 pounds
Gas	11,000 cubic feet
Coal tar	166 pounds
Ammonium sulphate	21.3 "

Coke produced from Miiké coal is hard and



Miike Chobai-Coke Works at the Miike Colliery



Dye Works attached to Miike Colliery

compact and is not to be distinguished from the best English coke.

Method of Mining

Within the galleries the walls are either coal-walls or bricked, except at the points of intersection of the drainage and ventilation galleries. Even within the same gallery several coal walls are made by limiting the divisions of the pit, so that in case of emergency damage may be confined to the smallest possible area.

In the main excavation of the seam is carried out by leaving coal posts. These are 66 sq. ft. in a room of some 15-ft. width. However, in parts of the Miyanoura and Manda pits the coal posts are 112 sq. ft., and the rooms 20 feet wide. When the coal post is being cut, it is dug out from top to bottom.

As a rule mining is performed exclusively by picks. The coal seams at Miiké have many cracks (one of the characteristics of the Miiké coal), so it is not practicable to blast. When the seam is more than 10-ft. thick mining is carried on by working in tiers, two or three,

from the top of the seam to the bottom. Often at the bottom of the seam silica rock is found, and this required blasting of the second or third tier.

When mining in the coal rooms four miners compose a gang. Their daily average is about eight tons of coal, two tons a man. But when the coal posts are being dug this production is usually increased about 20 per cent.

Although the chief cutting is done by picks, all the pits have recently been equipped with several coal cutters, and in cutting through faults, air-compressors and rock drills of the "Little Wonder" type are brought into use.

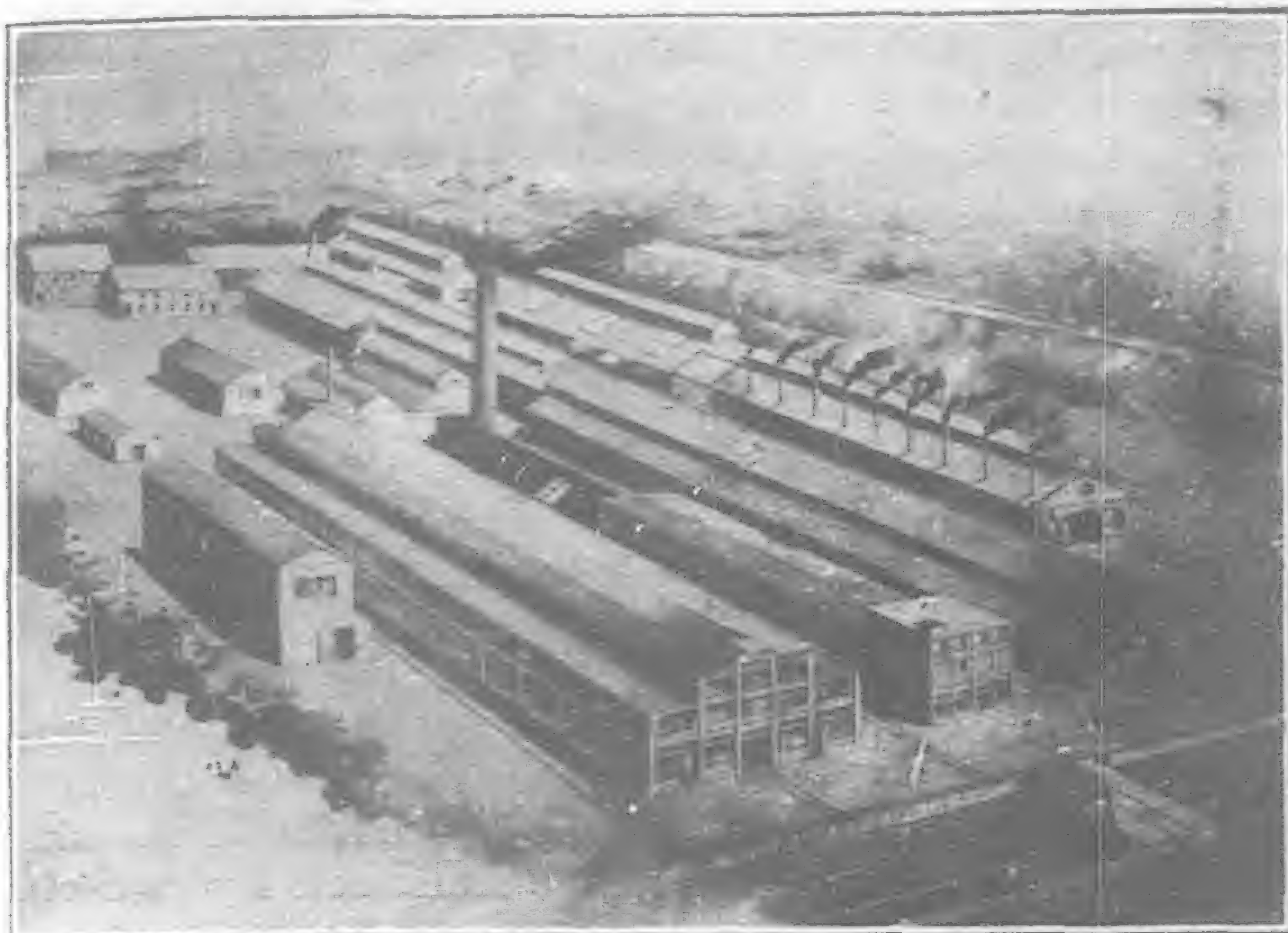
The upper seam of the Miiké field being very hard it is hardly necessary to use timber supports when mining is carried on by the coal room method. However, in the neighborhood of faults, a rock-seam of some 2-ft. thickness is often found in the upper seam; in such places timber supports 10-ft. long are used.

When mining is carried on by leaving coal posts, the pressure of the upper rock-seam



Miike Port: Showing Coal Loading Devices Loading the "Sanka Maru" owned by the Mitsui Bussan Kaisha

often becomes too great for the post to support, and the posts are suddenly crushed. In order to prevent this timbers 6-ft. long are built up in box form and the inner space is filled with rocks, so that the heavy upper seam may be supported without the coal post. The timber used is pine, and for every ton



Machine Shops of the Miike Collieries

of coal mined about one-eighth of a piece—ten feet long—is required, in the coal rooms. At intersecting points, or in the machine rooms within the galleries, steel and brick supports are built up.

Recently, although the coal post method with reinforcing props of timber and rock is most in use, the sand flushing method is being adopted. This almost guarantees safety both inside and outside the gallery. At the mouth of each pit, special apparatus is installed, except at Oura, by which sand, sand-rock, and sea sand are flushed into the vacated rooms.

The total seepage in the galleries of the Miike mines is 2,000 cubic feet a second, or 80,000 tons every 24 hours. For every ton of coal produced there is a seepage of 16 tons. During the rainy season (June-July) the quantity of water in the galleries is often increased 200 per cent. Each gallery is drained into one or two ditches, so that the water may be led off into the smallest possible area, this effecting an economy of pumping, and promoting the safety of operation. Both electric and steam pumps are used, except that pumping operations at the bottom of galleries are all performed by electric power. The pumping equipment of the Miike mines at the end of September, 1921, was as follows:—

Davy pumps	8 with a total of	6,180 h.p.
Duplex pumps	18	7,568
Centrifugal pumps directly connected with steam		

turbines of low pressure	2 with a total of	1,560 h.p.
Electric plunger pumps ..	36	1,203
Centrifugal electric pumps	56	6,980
Total	115	23,491 h.p.

Ventilation

As these mines employ the coal-post system of mining the difficulties of ventilation increase with the progress of mining. Consequently each gallery has its own ventilation apparatus. The kinds of fans in operation and their capacities are as follows:

Location	Kind	Capacity air replaced every second	Units	Total h.p.
Oura ..	Champion	70,000 cu. ft.	1	30
Miyanoura ..	Sirroco	150,000	1	200
Nanaura ..	Giebal	150,000	1	90
Miyahara ..	Sirocco	81,000	1	139
Katsutachi ..	Giebal	200,000	1	92
Manda ..	Walker	200,000	1	200
	(?)	300,000	1	500

For partial use in each gallery centrifugal	from 1,500 to 50,000 ..	23	164.6
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Total	30	1,315.5 h.p.
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Lighting System

Within the galleries Wolff and Zaiper type lights are in use. The important traction lines within the galleries and the machine rooms are equipped with a total of 2,600 electric lights of low pressure 100 volts.

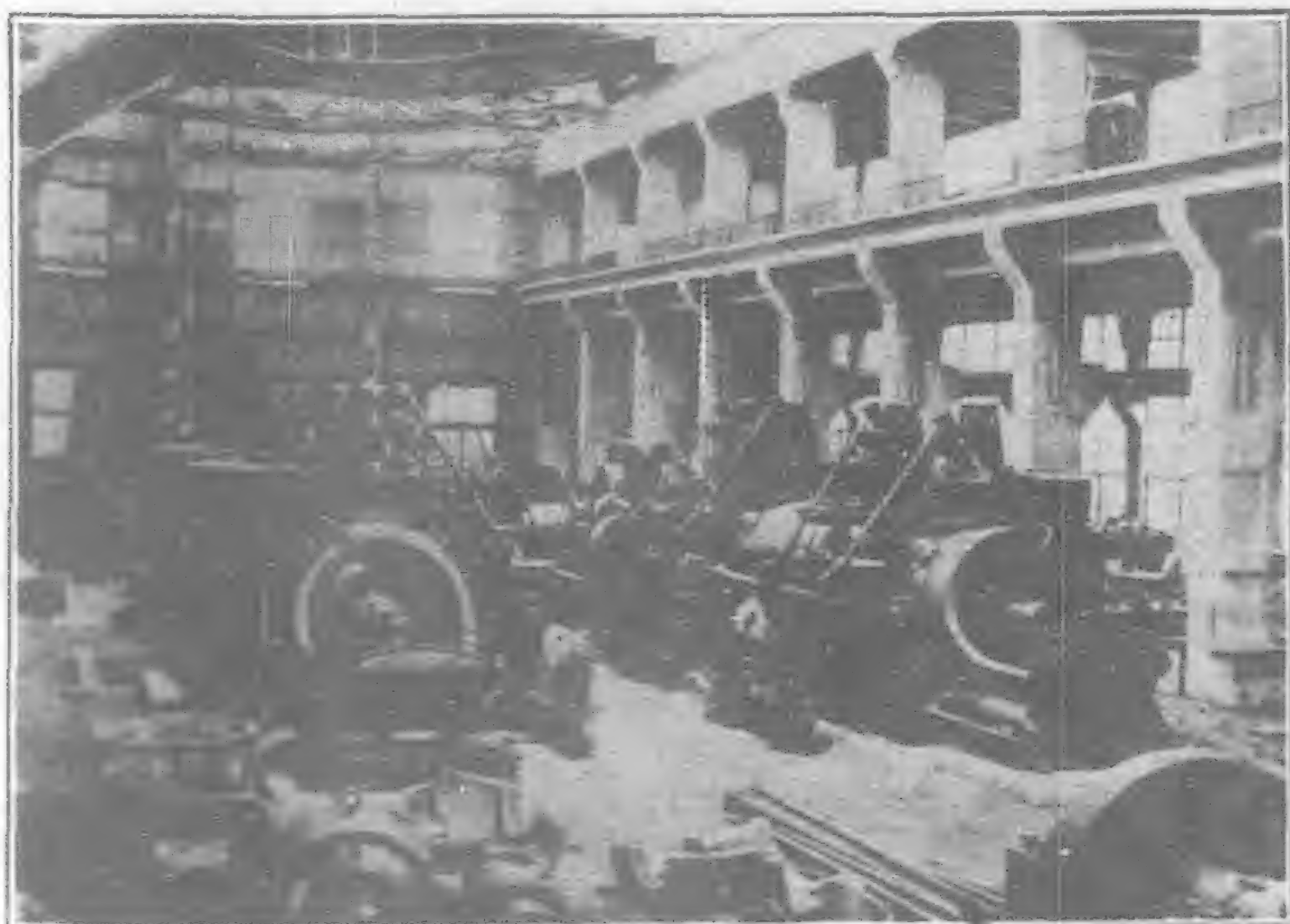
Underground Conveyance

All the galleries are tracked with 16 or 24 pound rails, gauge 1-ft. 6-in. The Manda pit has a 2-ft. gauge line.

The Manda pit is equipped with steel coal cars, with a capacity of 9.65 tons. The rest of the pits have wooden coal cars with a capacity of 0.45 tons. Short distance transportation is carried on by horses, but long distances are covered by electric or cable cars. There are something like 350 horses in the Miike collieries, some of which have been working for eight years, although their average efficiency is only three years.

Winch and endless-rope system is used for cable transportation. In the sloping galleries winches with a horse-power 10 to 60 are in use. These endless ropes are used in places where there are curbs, or where the slope often changes in degree; the horse-power of these engines ranges from 20 to 220.

At the mouth of the vertical pits and at the bottom of the galleries creepers are in use, especially in short steep slopes.



Interior Views of the Miike Collieries Machine Shops

Electric cars are used in the Manda pit, where there are 2.2 miles of lines underground. Twenty-three cars are in use, and each car weigh 4 tons; they have a speed of six miles an hour, and a traction power of 1,300 pounds. The list of traction equipment follows:

	Power	Number	Total Horse Power
Winches ..	Steam	2	23
" ..	Electric	33	1,100
Endless rope ..	Steam	3	240
" ..	Electric	29	1,950
Creepers ..	Electric	7	63.3
Electric Cars ..	—	23	460.
Total ..	..	97	3,839.3 h.p.

Transportation at Vertical Pits

Steam winding engines have been in general use at all the pits, furnished with hand and steam controllers. However, the number two pits of the Miyanoura mine (recently opened) is equipped with an electric hoist with hand and compressed air controller. The cage is of steel with wooden slides, equipped with safety-catch and safety-hook.

Recent head frames constructed at the No. 2 Miyanoura, at No. 1 and No. 2 pits of the Manda mine, are of steel. There are nine hoists at the mouth of each pit with a total capacity of 3,450 h.p. The Katsutachi, Mihara and Manda pits are equipped with steam-winding engines, six in all, with a total of 470 h.p.

Mine Railway System

Each of the mines is tapped by the railway system owned by the Mitsui interests. One line reaches Yokosuhama, another meets the Kyushu line of the government railways at Omuta, and the third transports coal to Miiké port, whence mining materials are also forwarded to the mines.

The Miiké mine field railways were licensed for construction in July, 1890, and construction was completed in July, 1891. In November, 1902, a great plan was adopted to build a harbor about 2½ miles south of the city of Omuta. The first part of the scheme was completed in November, 1908, and in March, 1910, the port of Miiké was opened. Since then the greatest part of the coal produced in this mine field is transported to the docks at Miiké by the colliery railway, and shipped to domestic centres by vessels owned by the Mitsui Mining Company, and abroad on vessels of all nationalities.

The total length of the railways is 43 miles 72 chains. The gauge is 3-ft 6-in., and the rail used is a 60-pound one. The coal-cars are made of steel, and wood, and of wood and steel. The steel cars have a capacity of 8 tons; the wooden cars of 4 tons, the wood and steel cars of 7 tons. All of these cars can be emptied from the bottom. There 742 coal cars, and 310 freight cars in operation. Sixteen steam locomotives are in use, each having a traction power of 4,000 to 8,000 pounds; and they range in weight from 14 to 24 tons. Between Miiké port and Miyanoura, there are twelve electric locomotives in operation, weighing 20 tons each, with a traction power of 8,000 pounds.

Method of Grading

Grading plants are built at each pit mouth, except at the Oura pit. In the neighborhood of Ichimairu a washing plant is in operation.

Dry Grading

Coal is directly transported to the screening plant in the cars sent from the pits. It is classified into small and dust. The large lumps are graded by hand, into big and medium. At Miyanoura, Katsutachi and Miyano-hara, two screening machines are set up. The Manada pit has four screening machines. All these are operated

by steam with the exception of those at Miyanoura which are operated by electricity.

Wet Grading

Coal sent from the screening plants is under 1½ inches in size. This cannot be graded by hand, so it is sifted and graded by water at the washing plant by a picking machine. Two lines of these machines operated by electric power are set up in this plant, having a total capacity of 1,500 tons in 24 hours. Another water-grading plant handles coal dust under ¾-in. This plant has a capacity of 600 tons every 24 hours, and its product is chiefly used for coke making.

Power Plants

There are two central electric power stations to supply the power required for various purposes around and in the mines. One of the plants is equipped with six Curtis steam-turbines of 1,000 kilowatts each. This plant is located at Yotsuyama coal storage yard. The other plant consists of four Nurenberg type gas engines of 3,000 h.p. each, and is operated by gas from the coke oven. When there is need of more power, or in cases of accident, the Yotsuyama power plant is able to turn in two 1,260 k.v.a. alternators, using power received from the Kumamoto Hydro-electric power company.

The maximum use of power to-day is 6,700 kilowatts. The daily average of power generated is 160,000 k.w. h.

The equipment of the plants is as follows:

STEAM POWER PLANT

Steam boiler: Sterling type, water-tube ..	420 h.p.	10 units
Babcock and Wilcox, water-tube ..	411.3	4
Curtis, vertical steam turbines ..	1,000 k.v.a.	5
Curtis, vertical steam turbines prime-mover	1,850 k.v.a.	1
Generator: direct connected, alternating current, connected with turbine; 3 phase, 40 cycle, 2,300 volts ..	1,000 k.v.a.	5
Same ..	1,850 k.v.a.	1
Alternator: 60 cycles, 40 cycles; 2,300 volts ..	1,260 k.v.a.	2

GAS POWER PLANT

Prime mover: Nurenberg, horizontal compound 4 cylinder gas engine ..	3,000 h.p.	2 units.
Generator: direct connected to gas engine, alternating current, 40 cycle; 2,300 volts ..	2,600 k.v.a.	2
Boilers: Lancashire ..	83	
Cornish ..	3	
Water-tube type	10	
Total ..	96	

Employees

The average number of employees in the mines during 1921 was 14,049.

Production

Production of the Miiké mines during the past five years was as follows:—

1917, 2,007,934; 1918, 1,885,881; 1919, 1,970,266; 1920, 1,932,798; 1921, 1,626,927 tons.

The Mitsui Bussan Kaisha has the exclusive right to market the Miiké coal.

The Port of Miiké

The inner port of Miiké is embraced between two piers which jut out to the north and south separated from each other by a distance of 6,000-ft. The total area of the port is 150,000 *tsubo*, and there is ample accommodation for coal ships and other cargo vessels.

The channel from the inner port to the outer port is 6,000 feet long, and at low tide is 18 feet deep.

The piers showing the channel are built 1 foot higher than the high water level; they are 12 feet wide, and 450 feet long.

A dock belonging to the Mitsui interests is also a part of the port equipment. Its area is 40,000 *tsubo*. By means of the water

gate the depth of the dock is maintained at 28 feet at its lowest. At the mooring wall the depth is maintained at 30-ft. and at high water this is increased 8-ft.

The mooring wall is 1,380-ft. long, with a capacity of three steamers of 10,000 tons at one time. The height of the wall is 41-ft. 6-in. There are three speedy loading machines on the wall, each having a capacity of 5,000 tons in 24 hours.

2. The Mines of the Hokkaido Colliery & Steamship Co., Ltd. (Hokkaido Tanko Kisen Kaisha)

THE Hokkaido Tanko Kisen K. K. is exclusively engaged in coal mining in the island of Hokkaido where it operates the following nine mines with a total area of 46,715,106 *tsubo* (*tsubo*= 36 sq. ft.):—

1. Yubari Mine, located at Yubari, Yubari Machi, Yubari Gun. Area, 7,924,774 *tsubo*.
2. Shin Yubari Mine, located at Shin Yubari, Yubari Machi, Yubari Gun. Area, 2,231,220 *tsubo*.
3. Wakanabe Mine, located at Wakanabe, Yubari Machi, etc. Area, 7,890,789 *tsubo*.
4. Mayachi Mine, located at Mayachi, Yubari Machi, etc. Area, 5,520,836 *tsubo*.
5. Noborikawa Mine, located at Noborikawa, Yubari Machi, etc. Area, 4,774,323 *tsubo*.
6. Manji Mine, located at Manji, Kurisawa Mura, Sprachi Gun. Area, 5,622,572 *tsubo*.
7. Sorachi Mine, located at Utashinai, Utashinai Mura, Sorachi Gun. Area, 9,879,530 *tsubo*.
8. Horonai Mine, located at Horonai, Mikasayama Mura, Sorachi Gun. Area, 1,508,817 *tsubo*.
9. Ikumarubetsu Mine, located at Ikumarubetsu, Mikasayama Mura, Sorachi Gun. Area, 1,362,245 *tsubo*.

These mines are located at inland points and connected by rail with the ports of Muroran and Otaru, distant some 80 to 110 miles from the mines. The production is constantly being increased by opening up new galleries, and by the installation of better and more modern machinery. Plans for development now under way

will eventually bring the total output up to 4,000,000 tons a year. The output for the past two years was as follows:

Name	1920	1921	When present extensions are completed
Yubari ..	739,925 tons	574,500 tons	1,300,000 tons
Shin Yubari ..	205,700	176,300	300,000
Wakanabe ..	174,918	196,400	500,000
Mayachi ..	147,400	103,700	200,000
Noborikawa ..	216,600	167,800	250,000
Manji ..	330,800	314,150	450,000
Sorachi ..	352,096	261,300	550,000
Horonai ..	202,500	175,100	250,000
Ikumarubetsu ..	144,500	126,300	200,000
Total ..	2,514,439	2,095,550	4,000,000

The coal mined in the Hokkaido is used in stove, factory locomotive, steamship, and in the manufacture of coke. The coal from the Yubari mine is best suited for the distillation of gas and coke. That from Horonai and Ikumarubetsu is particularly valuable for use as fuel in the production of gas. Hokkaido coal is sold on the Siberian coast, China, and North and South America, as well as in the Japanese domestic markets. The Mitsui Bussan Kaisha are the sole selling agents of the Hokkaido Tanko Kisen K. K.

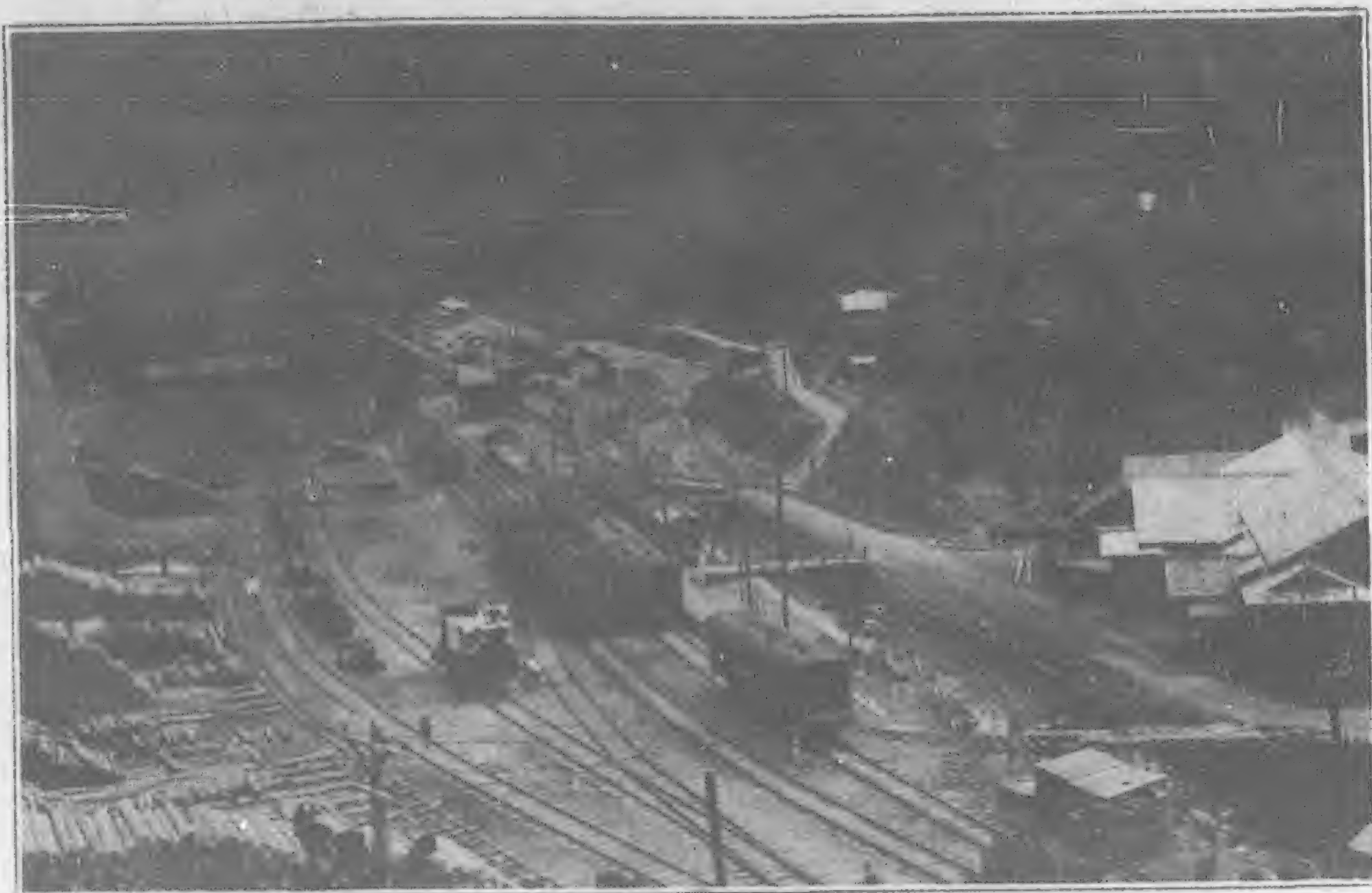
The Yubari Mine

The Yubari mine was discovered in 1888, and in 1889 the Hokkaido Tanko Kisen K. was organized to operate it. In 1892,

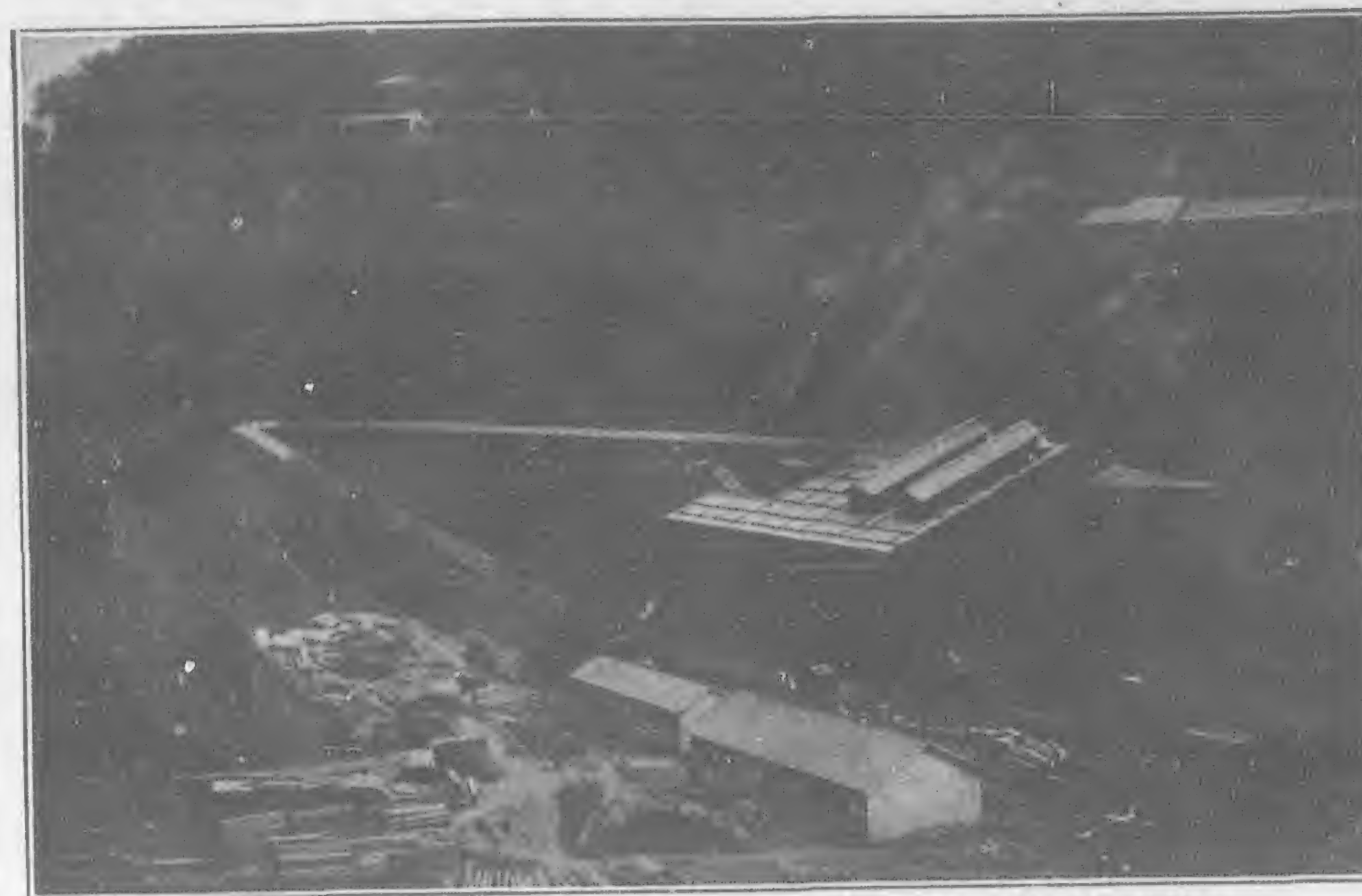


The Main Pit of the Yubari Colliery of the Hokkaido Tanko Kisen Kaisha

VIEWS OF THE HOKKAIDO TANKO KISEN KAISHA'S COLLIERIES IN HOKKAIDO



The Noborigawa Colliery



Coal Sorting and Screening Plant of the Futamizawa Pit of the Manji Mine



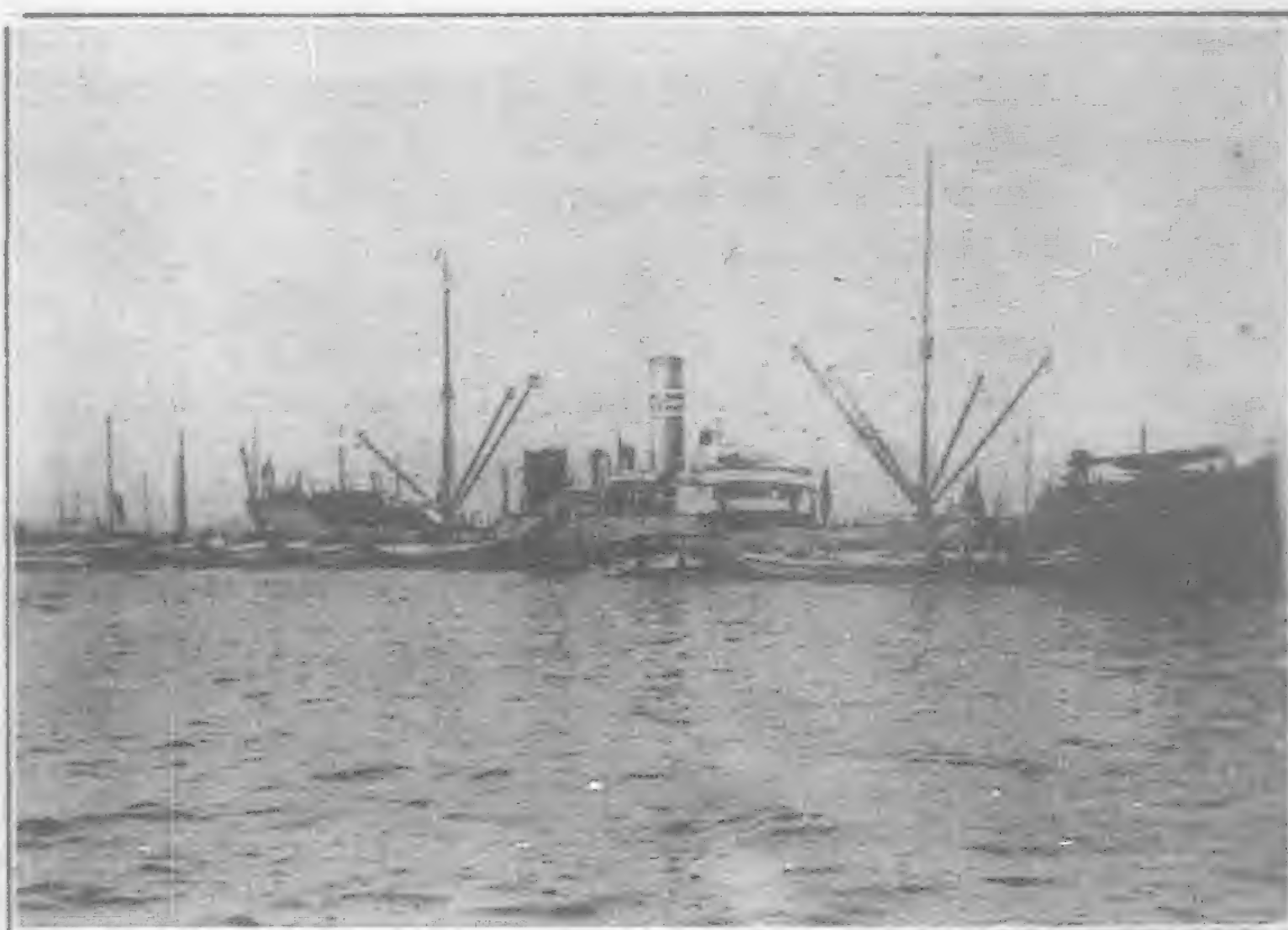
Coal Sorting at the Yubari Mine



Coal Sorting and Washing Plant of the Shin Yubari Mine



The Port of Muroran, Hokkaido, showing the Great Coal and Iron Ore Wharf



The "Yubari Maru," 6,200 tons, one of the Coal Fleet of the Hokkaido Tanko Kisen Kaisha

railway connection with the ports was completed and the mine thrown open to business.

The head of the coal seam appears at Shikorokabetsu, inclined from 15 to 20 degrees where it enters the mountains to the north-east of the field. The seam to the south is confused, and has three branches. The upper seam is four feet thick; the main seam is about 180 feet below the surface and is 24 feet thick; while the lower seam is 500-ft. down and is 4-ft. thick. All three seams are being mined.

The analysis of the coal from the Yubari mine is as follows:

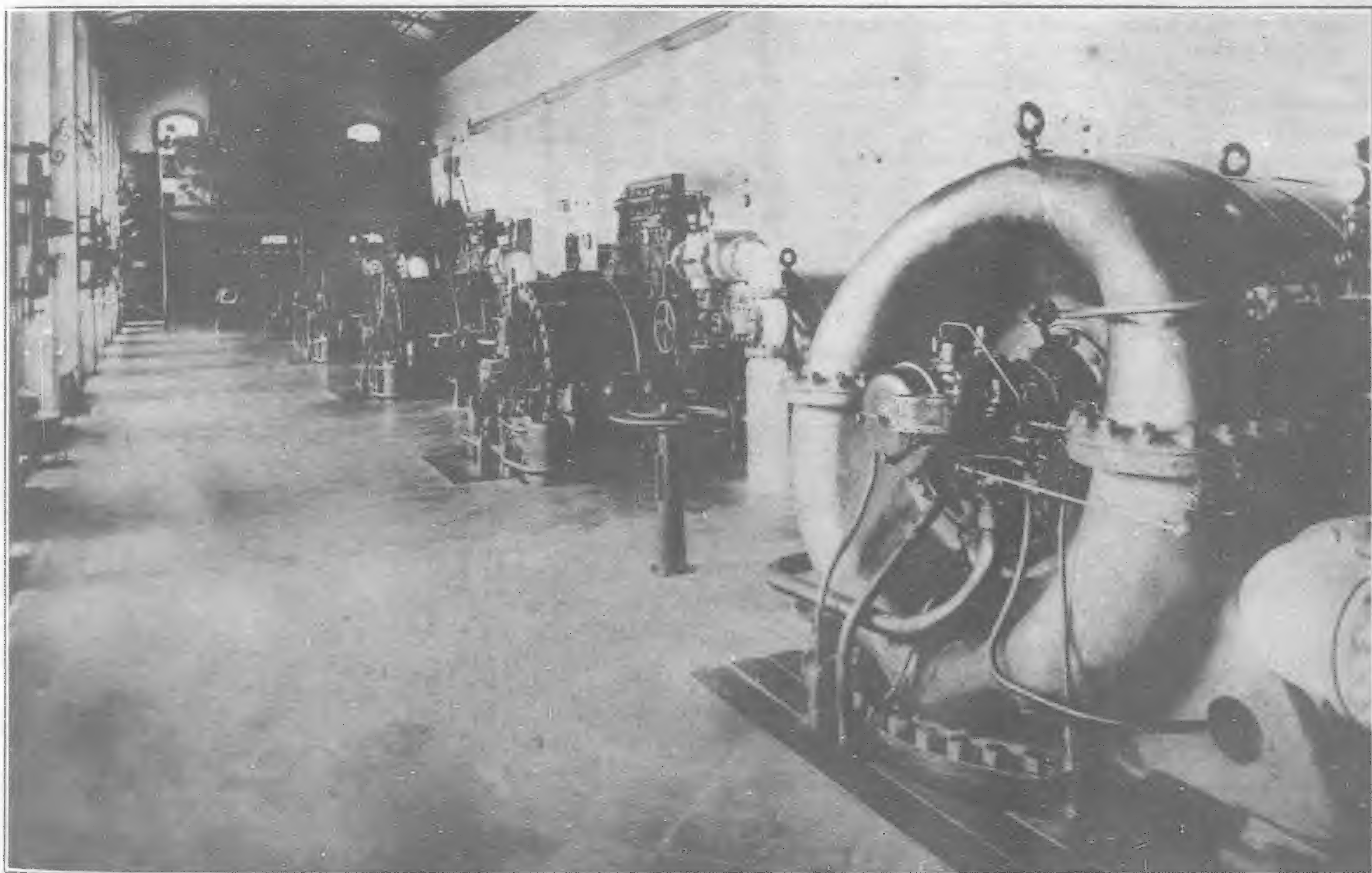
Water, 1.30; volatile matter, 46.47; fixed carbon, 48.17;

ash, 4.06; nitrogen, 1.43; sulphur, 0.34; calories, 7,810. The ash is brown.

Method of Mining

There are eight pit mouths to the Yubari mine, the Chitose, Kitagama, Mogami, Nagara, Daishin, Oi, and Jintsu. Where the pits are above the water level, galleries are opened directly into the seam from its outcrop, in pits under the water-level, either vertical or sloping galleries are opened.

Formerly, the method used was to open two adits on both sides of the seam at a distance of 500 feet from each other, at the same



The Central Power Plant of the Hokkaido Tanko Kisen Kaisha, supplying power to all mines of the Company, equipped with 12 B. & W. Boilers; 4—1,000 k.w. General Electric-Curtis turbo-alternating sets of 3,300 volts, 3 phase, 3,000 r.p.m.; and two 1,500 k.w. G. E., Curtis sets of 1,500 k.w.

time driving a ventilation adit, running at about 30 to 50 feet above the mining galleries. This ventilation adit was used to connect the two mining galleries, and mining was usually started through the ventilation gallery. The mined adits were limited to 1,000 feet in length and the circuit of the two adits was limited to 500 feet. Strong, heavy coal pillars were left, and all connection with other galleries was completely cut off to avoid accidents. This method was very unsatisfactory and has largely been superseded by more advanced methods.

In recent years the sand flushing system has been adopted and for the purposes of mining, two-step and three-step long walls are being used. The sand flushing equipment is erected at the pit mouths, and the sand dug in the neighborhood of the Kawabata station on the Yubari Railway line, and carried to the pit by that line.

The actual cutting of the coal is done by picks, or blasted by using soft powder. In order to open galleries rock-drills which are operated either by electricity or compressed-air are in use.

Timbering

Parts of the galleries are built up with bricks, but on the whole the greater part is supported by timbering in the shape of *torii*. Where mining is being carried on, *torii* shape props are used.

Drainage

Water which gushes into the galleries below the water-level is pumped out by electric power or compressed air; while that in the galleries above water is let out by gravity ditches.

The pumping equipment of these mines is as follows:—

Name of pit or gallery	Kind of pump	Capacity h.p.	Cu. ft.	Lift.	Number.
Kitakami North No. 2	Electric turbine	85	50	500-ft.	1
do.	do.	70	50	400	1
do.	Knowles special	16-in., dia of steam pipe			1
		7-in., dia of water pipe			1
Kitakami South No. 6	do.	do.			1
do.	Evans-Cornish	18-in., and 12-in.			1
do.	Electric turbine	85	50	500-ft.	1
Mogami No. 3 adit, bottom	do.	do.			2
Tenryu pit, East No. 1	Evans-Cornish	18-in. and 12-in.			1
Tenryu pit, East No. 3	do.	do.			2
Oi pit	Electric turbine	85 h.p.	50	500	2
do.	do.	120	50	700	1
do.	do.	50	30	500	1
do.	Electric three speed pump	15	15	300	1
Jintsu pit	Electric turbine	50	30	400	1
do.	do.	35	25	400	2
do.	do.	35	25	300	1

Ventilation

The galleries are ventilated throughout by fans operated by electricity or steam. The principal equipment is as follows:

Location	Kind	Diameter	Width	Power	Horse Power
Chitose	Giebal	20-ft.	8-ft.	steam	40 h.p.
"	Champion	8	4	electric	50 h.p.
Mogami	Sirocco	7-ft. 6-in.	5-ft. 3-in.	"	250
Daishin	"	10-ft. 6-in.	6-ft. 4-in.	"	500
Tenryu	"	7-ft. 6-in.	5-ft. 3-in.	"	250
"	Giebal	8-ft.	8-ft.	steam	40
Sanban	Champion	8	4	electric	50
Jintsu	"		do.		

Underground Transportation

Most of the galleries are double tracked with rails of 12 to 18 pounds, gauge 50 centimetres. Each car has a capacity of 0.8 tons, and empty weighs 700 pounds. From the place where mining is going on to the mouth of the gallery transportation is done on bicycle roads, taking advantage of the slope or by "shute" or "face conveyors." Within the galleries hauling is done by horses, except in the Chitose pit where an air-driven locomotive is employed.

The Daishin vertical pit 18 feet diameter is built up with brick to a depth of 560 feet. At a point 193 feet below the pit mouth a tunnel is opened into the vertical pit making a connection with the outside. An electric railway is operated through this tunnel, connecting it with the coal grading plan, at the main pit. The hoist of this pit operated by electricity is set up at the pit mouth on top of a mountain, and it hauls up four cars at one time.

Transportation outside the mines is carried on by electric locomotives or horses. The equipment is as follows:

Location	Kind	Diameter or drum	H.P.	Diameter of cable	Length
Kitagami	steam cycle grooved drum	6-ft.	200 h.p.	1½-in.	4,800-ft.
Mogami	Electric cycle conical drum	9	150	1½	3,000
Daishin	Electric winch double drum	9	200	1½	600
do.	Electric cycle conical drum	9	100	1½	1,700
Tenryu, East slope pit	do.	9	150	1½	1,500
Tenryu, West slope pit	do.	9	150	1½	1,700
Oi	Electric winch double drum	6-ft. 6-in.	150	1½	400
Jintsu	Electric cycle conical drum	8	50	1½	1,500
Jintsu pit, outside	Electric winch double drum	3-ft. 4-in.	50	¾-in.	500
Teimi pit, outside	Electric cycle conical drum	6-ft.	50	¾-in.	2,500
Main pit, outside	Electric cycle	5-ft.	50	¾-in.	700

Several small hoists are installed for use at any time.



Electric Locomotive Hauling out Loaded Coal Cars at Kumanosawa, the 7th Pit of the Shin Yubari Mine of the Hokkaido Tanko Kisen Kaisha

Method of Grading

Both the Teimi pit and the main pit are equipped with coal picking machines. The capacity of the machine at the main pit is 1,500 tons in ten hours. Three Gimmer (?) type screens sift the coal into large, small, and dust. The third grade coal is graded by picking out the large lumps, and small lumps are selected by hand. The storage bin for graded coal has a capacity of 2,000 tons. Another bin of 3,000 tons is now under construction.

The machine at the Teimi pit has the same capacity as that at the main pit, and the coal is sifted in the same way. Large lumps are sent to a Markas' picking table, smaller lumps are selected by the picking band, and the dust is sent directly into the bin.

Second grade coal is sifted into large, small and dust by one Gimmer's screen; the small lumps are again sifted into medium lump and small. The small lumps are then sent to a Brackett type coal washing machine where they are graded. The coal bin at this pit has a capacity of 1,900 tons.

Air Compressors

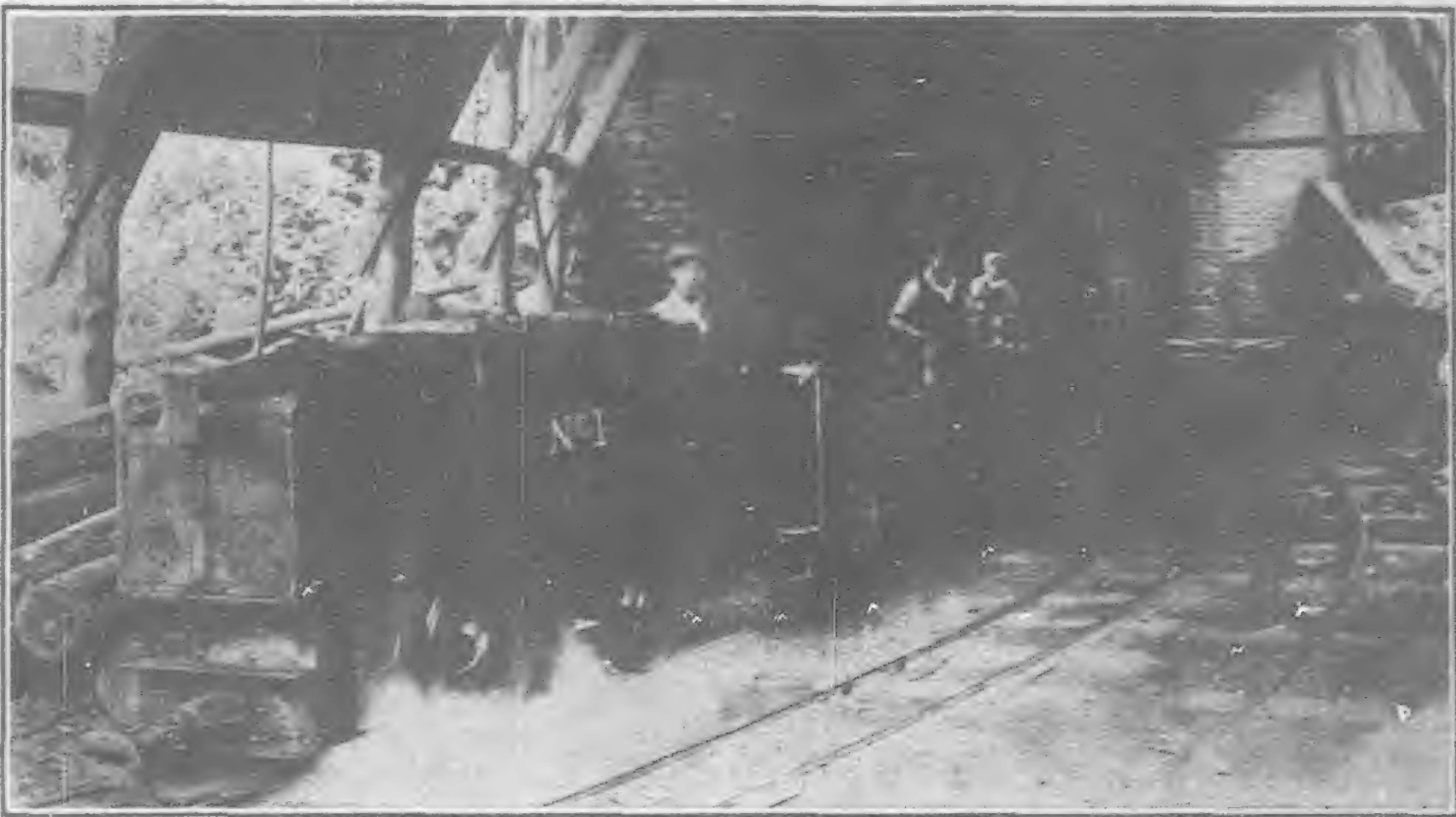
In order to meet the need for compressed air for the gallery pumps, coal cutting machines, small type fans, and air locomotives, air compressors are installed in the following place:—

Description of machine	Main Pit	Teimi Pit	Daishin
Diameter of steam cylinder ...	24-in	(1) 20 (2) 22 (3) 25-in.	Elec. 25-in.
Diameter of air pipe	24½	22½ 16½	15-in. 15½-in.
Stroke ...	42	42 24	20 18
Rotations per second	75	65 90	150 214
Quantity of air compressed ...	2,624 cu. ft.	2,330 400	1,695 2,175
Highest pressure ...	100-lbs.	80 800	80 100
Horse power ...	646	480 670	300 348
Machines installed ...	2	1 1	1 1

Boiler Equipment

Power for the air compressors, winches and steam heaters the following boiler equipment has been installed as follows:

Lancaster.	Main Pit.	Teimi Pit.
Diameter of boiler ..	6-ft. 6-in.	6-ft. 6-in.
Length of boiler ..	24-ft.	24-ft.
Length of flame tube ..	2-ft. 6-in.	2-ft. 6-in.
Heating area ..	580 sq. ft.	580 sq. ft.
Steam pressure..	80-lbs.	80-lbs.
Number installed ..	8	7



Compressed Air Locomotive at the Wakanabe Pit Mouth of the Hokkaido Tanko Kisen Kaisha

Electric Equipment

Electricity is supplied to all the mines of the Hokkaido Tanko Kisen K.K. from a central power station erected in the neighborhood of the Teimi Coal Grading Station. This station is equipped with:—

1. Four Curtis steam turbines, 1,000 kilowatts, 150-lbs. pressure, 3,000 r.p.m.
2. Two Curtis steam turbines, 1,500 kilowatts, 150-lbs. pressure, 3,000 r.p.m.
3. Four G.E. alternating current generator, 3 phase, 3,300 volts, 1,000 kilowatts, 3,000 r.p.m.
4. One general electric; same; except 1,500 kilowatts.
5. Twelve Babcock & Wilcox water-tube boiler, heating area 3,441 sq. ft. grate area, 70 sq. ft. h.p. 400, steam pressure, 155-lbs. In addition, rotary air pumps, centrifugal water pumps, switchboards of various kinds, hand cranes, water pumps, water heaters, coolers, etc., are installed. Electric power is chiefly used to operate the fans, hoists, coal grading machines, pumps and general construction work. The company uses 13,000 lights of 10 candle-power each, and supplies power and light to the towns in the district. Direct current of 550 volt is used in the electric cars. The power plant is furnished with two rotary transformers of 150 kilowatts.

Machine Shop

The mines carry on their own repair work in a machine shop at the Yubari mine, divided into wood working, engineering, casting, tempering, lathe and finishing departments. Castings under 5



Relief Party at Work in the Yubari Mine



Futamizawa Pit of the Manji Mine

tons are made, and in the tempering a half-ton steam hammer is installed. The lathe section is equipped with lathes from 6 to 20 feet long, and turbo-blowers operated by 20, 30, 10 and 50 h.p. motors.

The Manji Mine

This mine was opened to business in 1909 and in 1914 it was connected by railway with the imperial government lines at Shibun. There are three seams 4, 6 and 7 feet thick which outcrop at bed of the Poroporohoromui River.

The coal of this mine analyses ; Water, 1.90 ; volatile matter, 41.04 ; fixed carbon, 51.75 ; ash, 5.31 ; nitrogen, 1.33 ; sulphur, 0.38 ; calories, 7,700 ; color of ash, reddish brown.

The principal shafts now being worked are the Fukuju, Botan, Sakura, Aoi, Momiji, all belonging to the main pit, and the Hinode and Hatsune, belonging to the Mirudo pit opened to business in February, 1918. All of the Manji pits use turbine pumps of 12 to 85 h.p., having a capacity of 10 to 50 cu. ft., and a lift of 300 to 500 feet of which fourteen are installed.

Ventilation is effected by electric fans having a diameter of 4 to 8 feet, with blades 2 to 4 feet wide, operated by motors of 15 to 50 h.p. All pits are equipped with the champion fan, except the Sakura, which uses the Sirroco.

Grading is carried on at the Manji and Mirudo pits, the machine at the Manji pit having a capacity of 1,500 tons in ten hours, and operates three screens. The coal bin here has a capacity of 1,500 tons. The capacity of the Mirudo grading machine is 600 tons in in ten hours, it operates two rotary screens, and dumps into a 1,000-ton bin.

This mine is equipped with 3-500 K.V.A. transformers of 3,300 volts each, to handle power transmitted from the main plant at \$22,000 volts. Three 100 K.V.A. transformers are also installed to change the 3,300 volts to 550 volts. This power is chiefly used to operate the fans, winches, grading machines, pumps, etc. This station supplies over 4,000 ten candle-power lights.

The Noborikawa Mine

The Noborikawa mine was acquired by the Hokkaido Tanko Kisen K.K., in November, 1919, after eight years of operation under the Mitsui Mining Co. The strata are rather confused with many faults. The seam under operation is comparatively regular, however running from south to north through a mountain chain more than 700 feet high, outcropping on the mountain side. There are several seam, only one of which is mined at present. It is 10 feet thick, and inclines from 40 to 60 degrees towards the east.

The coal mined is hard with fine black gloss. It is easy to burn, has a high thermal value, and is used for factories, railways, and steamers. One particular use of this coal is in pottery works, and is the favorite fuel of the pottery kilns in the Nagoya district. For many years the imperial government railways have been using this coal to produce gas. Its analyses follows :

Water, 3.37 ; volatile matter, 42.60 ; fixed carbon, 49.62 ; ash, 4.40 ; nitrogen, 1.47 ; sulphur, 0.24 ; calories, 7,480 ; color of ash, gray brown.

The slope of this mine being particularly steep, the coal mined is carried by chute to the funnel set up at the pit mouth, whence it is transferred to coal cars and hauled off either by horse or man power cars. Coal mined in the lower galleries is hauled up by winches, and transported by electric locomotives to the grading plants. The main gallery has three electric winches with single drums, having a diameter of 5, 5 and 2 feet, of 100, 60 and 30 horsepower. The diameter of the cable is 1 inch, and the length, 1,000, 1,000 and 1,500 feet. Methods of mining, timbering, etc., are the same as at the Yubari mine. This mine has two grading plants, with capacities of 500 tons, and 300 tons in 10 hours. Another plant of 300 tons is now under construction. Three electric air compressors with a capacity of 600 cu. ft. per second are used for rock drilling.

The Shin Yubari Mine

The outcrop was discovered in 1888, and mining was begun in 1904. In January, 1920, the mine was acquired from the Ishikari Coal Co. The main seam of this mine 34 feet thick is a continuation of the Yubari seam. Above this are two other seams, three and four feet thick, separated by about 160 feet. The strata are rather confused, wave shape ; the general direction being south-east and north-west.

The coal is similar to that of the Yubari mine. The Tokyo Gas Co. uses the product of this mine exclusively, its annual consumption being about 300,000 tons. The large quantity of gas produced, and the small sulphur content are characteristics of this coal.

Analysis : Water, 1.51 ; volatile matter, 43.19 ; fixed carbon, 49.57 ; ash, 5.73 ; nitrogen, 1.42 ; sulphur, 0.25 ; calories, 7,590 ; color of ash, light yellow brown.

The equipment of this mine is practically the same in all particulars as that of the Yubari and other mines owned by the company.

It owns and operates a saw mill in the neighborhood of Shikano Tani station, equipped with three band saws, one vertical saw, two medium size circular saws and one drag saw. Its capacity is something like 1,000,000 c.ft., per month.

The Wakanabe Mine

The Wakanabe mine was opened to business in May, 1906, by the Ishikari Sekitan K.K., and transferred to the Hokkaido Tanko Kisen K.K. in January, 1920.

There are many large and small waves in the seam, and many faults make the seam rather confused. The seam now under operation runs from east to west with an average incline of 45 degrees in the direction of the north. It is divided into three parts, upper, middle and lower, with thicknesses of 6, 10 to 16, and 4 feet. The mining work has not penetrated to the lower seam so far. It is located about 400 feet below the middle seam.

The south pit of this mine opened in 1914 has four seams, the three upper seams being 4, 8 and 4 feet thick. The lowest or main seam, is 10 to 15 feet thick. Operations have not yet reached this seam, but sloping galleries are now being constructed to open this seam to mining work.

The coal has a high thermal value. It cracks but little, and is especially fit for all fuel purposes and the manufacture of coke and gas. It analyses :

Water, 1.26 ; volatile matter, 46.85 ; fixed carbon, 47.05 ; ash, 4.84 ; nitrogen, 1.28 ; sulphur, 0.27 ; calories, 7,590 ; color of ash, yellow brown.

Equipment is practically the same as that of the other mines.

Mentoukou Coal Mines

M. Mamet, the well-known Belgian mining engineer of the Sino-British Coal Mining Company, has announced that an excellent seam of coal has been struck at Mentoukou, measuring on the average four Chinese feet. Mentoukou is about 40 li from Peking, at the base of the Western Hills, beyond the Hunbo.

The Sino-British Coal Mining Company as its name indicates is a Chinese and British concern, in which McBains of Shanghai are largely interested.

The preliminary work has been carried on under exceptional difficulties. The arrival of pumping plant was delayed as a result of the war, and it was impossible for some time to cope with the flow of water. Then the neighboring electric plant proved unable to supply the necessary power, owing to the silt-laden condition of the rushing Hun river. The difficulties have been steadily overcome, and Peking, which has hitherto been largely dependent on Honan, will rejoice at last in having its own supply of valuable coal.

The Chinese Eastern Railway

[Data from Last Annual Report]

Head Office: Harbin. *Officers and Board of Directors:* President and Director-General, Chin-Chun Wang, C.E., Ph. D., LL.D.; Chinese Directors: Yu Jen-feng, Ho Shou-jen, Yuan King-kai and Chen Tulow; Vice-President, Danilevsky; Russian Directors: Koushetzoff, Poushkareff, Richter and Dissenky; General Manager, Ostroumoff; Assistant General Manager, C. T. Shar.

Cable Address: "C.E.R." (in English); "Pravlenie" (to the Company in Russian); "Opravlenie" (to the Railway Administration Office in Russian).

History: The history of the Chinese Eastern Railway began in 1896, when the Chinese government invested 5,000,000 taels in the Russo-Chinese Bank to join its partnership. One particular enterprise that both the Chinese government and the Russian government had then in view was the construction of the Chinese Eastern Railway.

To relate the story more accurately, however, it must be said that the Russian government was more anxious to have the line than the Chinese government. For up to this time, Russia had been seeking for an ice-free port for her navy; but many attempts were frustrated. So she began to cast her eye on Port Authur and Dairen—two ice-free ports. In the meanwhile, she had just been building the gigantic Siberian Railway. It would shorten the distance between the continents of Asia and Europe in a still more amazing degree, if another line passing through the Chinese territory could be built to connect it. Therefore with motives primarily political and military, the Russian government interested the Chinese government in the construction of this line, and in September 1896, an agreement was reached between the Chinese government and the Russo-Chinese Bank. It was agreed that the financing of the railway should be undertaken by the Russo-Chinese Bank. A railway company separate from the Bank, called the "Chinese Eastern Railway Company," was established with shares of 5 million roubles as the initial capital to be sold only to Chinese and Russians. The Chinese government shall have the right to appoint the president of the railway, whose duty is to look after China's interests both in the bank and in the railway.

By this agreement, the company is given by China a vast quantity of public lands along the railway free of charge or at reduced prices. The company is exempted from all kinds of duties on materials used by the railway, and all taxes on the lands that are used by the railway.

To reciprocate the many fold privileges that the company receives from the Chinese government, the agreement requires that beginning from its first day of operation, the railway should pay to the Chinese government five million taels, which, however, have never been paid yet. It was further agreed that all profits of the railway, after that part which is distributable to the shareholders, shall be applied to the redemption of the railway in behalf of China. After eighty years, the railway, together with all its movable and immovable properties, shall be returned to the Chinese government without any cost, and with all its debt to the Russian government being cancelled. The Chinese government also reserves the right to redeem the whole line at cost after thirty-six years.

The whole line, as provided in the agreement, must be completed in six years. The construction of the branch line, called the South Manchuria line, giving Russia an access to ice-free ports, Port Authur and Dairen, started two years later. Thus this line enabled Russia to penetrate into the three eastern provinces and procure two strong naval bases. But this precipitated the Japanese-Russo war, as a consequence of which the South Manchuria line was yielded to Japan.

It is important to note that the management of the railway was wholly in the hands of the Russians, who had a definite policy of colonization. For some time, a large army was kept on the line, contrary to the original agreement. Expenses, having nothing to do with the railway, were charged to the line, though actually paid by the Russian government. Curious to say that the Chinese government, though invested in the right of appointing a president, did not exercise this right except once at the beginning, and then until recently.

The outbreak of the world war, however, brought about



Dr. Chin Chun Wang, C.E., Ph. D., LL.D.
President and Director General of the Chinese Eastern Railway



Harbin Station



Chinese Eastern Railway Administration Building at Harbin



C.E.R. : Main Shops at Harbin

great changes. The breakdown of the Russian government suddenly left the Chinese Eastern Railway in a most precarious position. In order to help the line financially and technically, the allies, as a temporary measure, formed the inter-allied technical board. At this critical juncture, China, having the sovereign rights over this territory wherein lies the railway and considerable financial interests in the railway as shown above, and being the sole partner of Russia in the enterprise, naturally stepped in to give help to the railway. An agreement was concluded between the Chinese government and the Russo-Chinese Bank, representing the shareholders, in 1920. By this agreement, the Chinese government is given the temporary responsibility of supervising the line. At present, the railway is being run under the provisions of the 1920 agreement. By this agreement, China only asserted some supervisory power, by adding four members into the board of directors, thus making the member-



C.E.R. : Round House at Progranichnaya

sists of the president's office, the company, and the railway administration. At the head there is a director-general of Chinese nationality, appointed by the Chinese government to oversee the management of the railway, and look after China's interests in the enterprise. In the president's office, the work is divided into four sections and supervised by the chief secretary and the counsellor.

The company is the law-making organ, consisting of the board of directors and board of audits. There are nine directors, four of whom are Chinese, appointed by the Chinese government. The other five are Russians. The Chinese director-general is the *ex-officio* president of the board of directors. The board decides the general policies of the railway. Measures of the board of directors cannot be legalised unless approved by seven votes. The detailed work of the board is performed by three departments: General administration, financial department, and technical department. Besides, there is a board of audits, which has five members, two



C.E.R. : Round House at Hailar

ship of this supervising body half Chinese and half Russian. As it requires seven votes to pass anything, neither the Chinese nor the Russians can decide anything without the approval of the other. As to the actual management, practically nothing is changed. The whole executive power still rests in the hands of the general manager, who is a Russian nominated by the Russo-Asiatic Bank. So all the change that has been made is that China has taken one-half of the supervising power into her hands, while leaving everything else still in the hands of the Russians.

Location and Extent : This line lies in the heart of the three Manchurian provinces and links Asia and Europe together. At its northwest extreme, it connects the Siberian Railway at Manchuli, the last station in Chinese territory. At its east extreme, it connects Vladivostok. A branch, connecting the South Manchuria line, runs from Harbin to Changchun; from there, connection is made to Mukden, to Peking, to Dairen and to Korea. The length of the main line is 1726-83 kilometres, and that of its branch is 480-17 kilometres. The whole line is surrounded with fertile agricultural fields, grazing lands and rich mineral resources.

Organization : The whole organization broadly speaking con-



C.E.R. : Station and Yards at Manchuli

of whom are Chinese appointed by the Chinese government, the other three members being Russian. The chairman of the board must be of Chinese nationality. This board examines and audits the financial records and transactions of the railway.

The railway administration has the special charge of the running and management of the railway. It is the most important in that it has the whole management of this railway in hand. At the head, there is a general manager of Russian nationality who is the chief executive. His powers are ample and extensive. He practically runs the whole show. Besides, there are a Chinese assistant general manager and two Russian assistant general managers assisting him. This office has some twenty departments such as: General administration, legal department, accounting department, mechanical department, traffic department, business department, engineering department, materials department, navigation department, secretarial department, telegraph department, printing department, auditing department, pension department, land investment department, medical department, education department and veterinary department. The heads of these departments are Russians. But recently several important departments



C.E.R. : Express Train at Harbin

such as accounting, operation, commercial, mechanical, engineering, materials and land departments have added Chinese assistant chiefs. All these chiefs and the subordinates are under the general manager, who practically has the power of appointment and discharge over them.

Character of Traffic: The transportation revenue for 1921 was 39,785,677.19 roubles. Of this sum, the freight receipts forms a greater part than the passenger receipts. The freight, broadly speaking, consists of agricultural products, livestock, lumber and minerals. The total amount actually transported on this line for 1921 was 126,149,527 poods (Russian standard of weight equal to 29 catties, or 40 pounds). Agricultural products usually furnish the largest part of the freight. For instance in 1920, of the freight, 58 per cent. was agricultural products; 32 per cent. lumber; 10 per cent. mineral; and 1 per cent. livestock. Agricultural products include wheat, grain, flour, bean, beanoil and bean cakes.



C.E.R.: The Spiral Climb over the Khingan Mountains



Fortified Tunnel at Hing An (Khingian Mountains)

The freight service handles, of course, goods exported as well as goods imported. Imported goods handled by this line consist chiefly of salt, iron wares, manufactured articles, petroleum, cement and sugar. For the year 1921, the figures are as follows:

Salt	1,826,000 Poods
Iron wares	1,240,000 "
Manufactured articles	1,062,000 "
Fruits	764,000 "
Petroleum	415,000 "
Cement	492,000 "
Sugar	715,000 "

EQUIPMENT

Locomotives: Locomotives 536.....434,867 horse power.

8 Wheel Passenger Carriages:

Special carriages ..	15.....	150	passenger capacity
First-class carriages	30.....	660	" "
Mixed " "	23.....	598	" "
2nd " "	30.....	960	" "
3rd " "	51.....	2,448	" "
Mail " "	11.....	66	" "
Baggage " "	15.....	210	" "
Dining car	18.....	210	" "

4 Wheel Passenger Carriages:

Special carriages ..	79.....	395	passenger capacity
Mixed	23.....	460	" "
1st Class	23.....	368	" "
2nd " "	72.....	2,160	" "
3rd " "	193.....	9,264	" "
4th " "	51.....	1,632	" "
3rd " mail carriage	7.....	112	" "
Baggage cars ..	24.....	120	" "
Prisoner carriages ..	18.....	756	" "
Health	15.....	150	" "

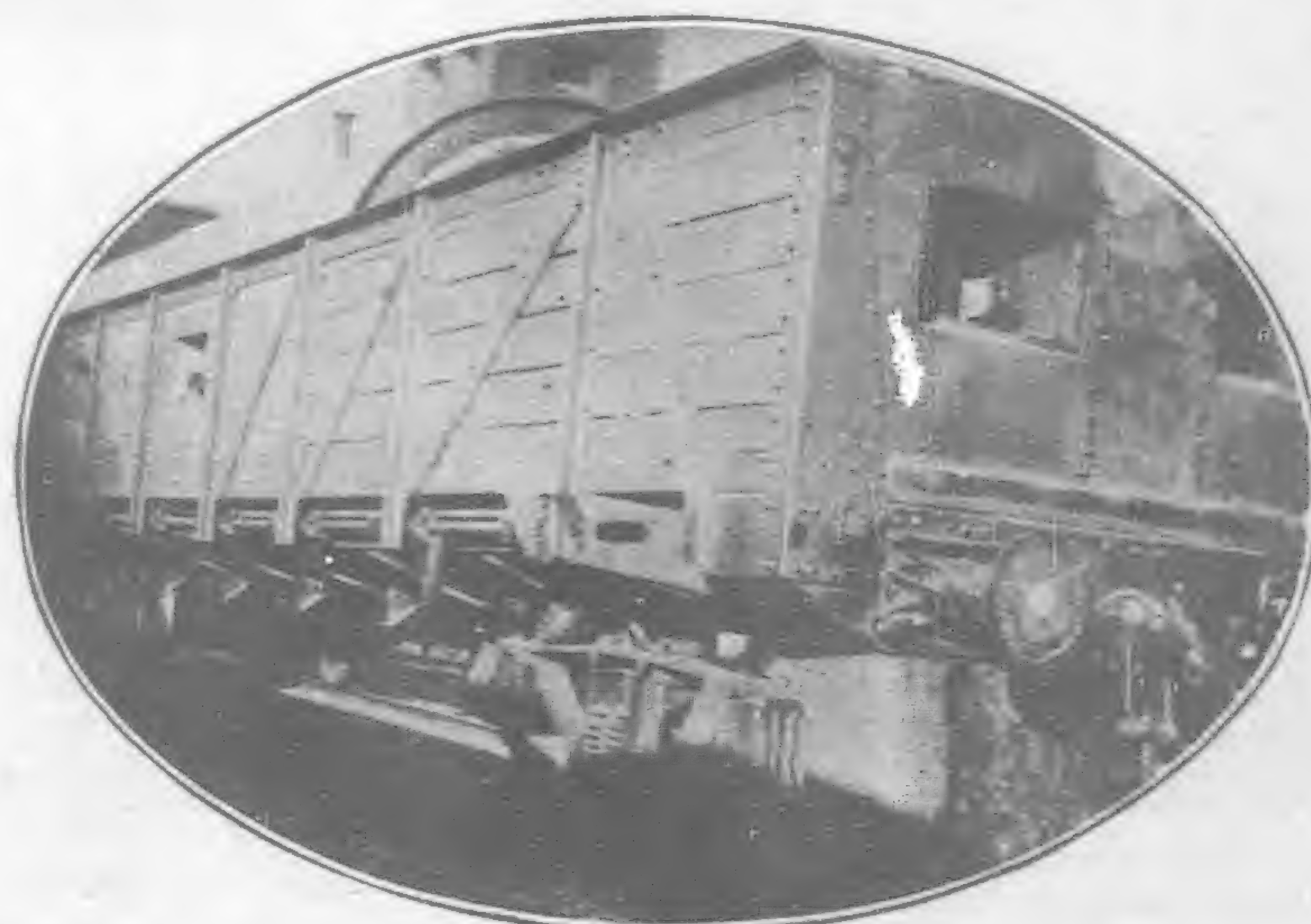
Freight Cars: 10,626 freight cars of 222,252 tons capacity including:

Russian style wagons	5,289.....	84,624	Tons capacity
American " "	860.....	16,770	" "
Covered " "	418.....	18,183	" "
Common " "	3,542.....	95,732	" "
Ice " "	169.....	3,834	" "
Oil " "	295.....	3,835	" "
Special " "	53.....	742	" "

Depôts: Depôts containing back shop and roundhouse and doing car repairs and light and running locomotive repairs are as follows:

Harbin: Hengdaohotze: Pogranitchnaya: Tsitsikar: Pukedoo: Hailar.

Main Shops: Harbin main shops consist of the following:—Old iron foundry: new iron and steel foundries: shops: black



C.E.R.: Armored Car



C.E.R. : Bridge over the Sungari River at Harbin

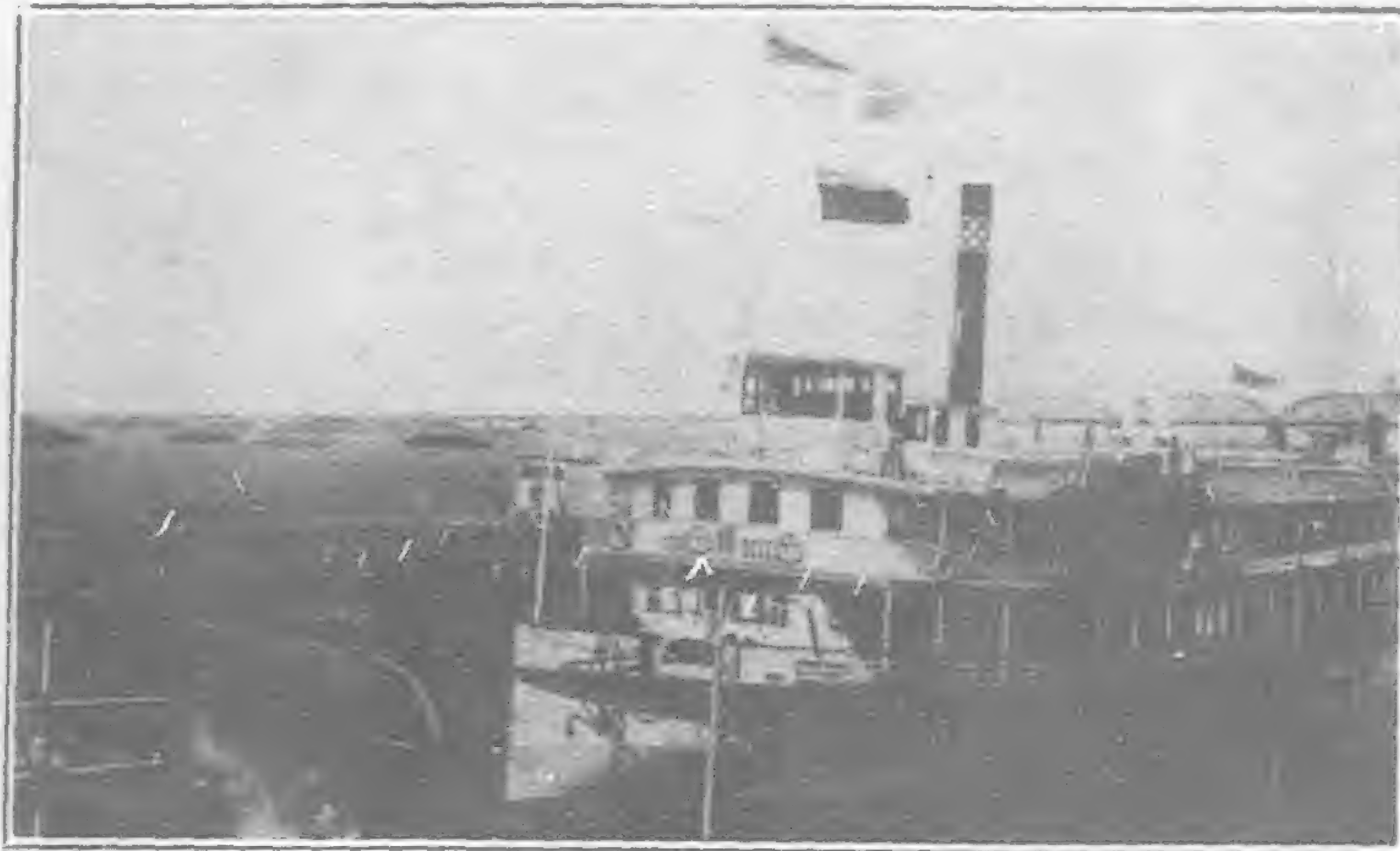
smith : machine : wheel : boiler : tube : erecting : tender : dépôt :
passenger car : freight : saw mill : power station : chemical
testing laboratories.

INCOME AND EXPENSES OF THE CHINESE EASTERN RAILWAY
FOR THE YEAR ENDING DECEMBER 31, 1921.

	Roubles	Roubles
Transportation revenue	39,785,677.19	
Transportation expense		32,420,216.40
Directorate		1,100,019.61
General administration		6,285,080.61
Maintenance of way and works		5,685,023.64
Traffic and running		3,737,867.72
Maintenance of equipment		12,234,005.87
Interchange of rolling stock		30,349.98
Emergencies		2,830,562.33
Additions and betterments		544,306.64
Special revenue		
(Per special budget)	2,120,124.99	
Special expense		
(Per special budget)		6,450,023.77
		*3,035,562.01
	41,905,802.18	41,905,802.18

The Inter-Allied Technical Board : The inter-allied technical board, represented by the United States, England, China, France, Italy, Japan and Russia, was organized in the winter of 1918. The reasons for organizing this board were various, among which one was to give the Czechoslovacs transportation facilities to join Russia to fight against Germany, and the other was to transport allies' troops to Siberia to maintain order there. At that time the allied nations were particularly anxious to protect the Siberian Railway and the Chinese Eastern Railway, in order to make the communication between Asia and Europe uninterrupted. During the course of the great war, many allied troops were actually transported on this line, and the board rendered some valuable services. But the board was originally intended

* Profit.



C.E.R. : Steamboats on the Sungari River



C.E.R. : Near Progranichnaya



C.E.R. : Jalaigor Coal Mines

for a war measure. And it is provided in the agreement that the board shall be dissolved as soon as allied troops should be withdrawn. Now their troops have been withdrawn except a part of the Japanese troops.

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(3 patterns), automobile and bicycle wrenches and adjustable "S" wrenches.

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The North American Road Situation

How the Experiences of the United States in Providing Satisfactory Roads for Ten Million Motor Vehicles May Serve as an Example—in Some Instances as a Warning Example—to Road Builders and Organizers in other Countries.

EXPENDITURES in the United States for road building during the year 1910 approximated \$120,000,000. This sum included money spent by the U. S. government, by the various states, and by township, municipal and other local units.



The above shows a road made of concrete in the Eastern part of the United States, where the population is comparatively thick and motor traffic is heavy

In the year 1921, on the contrary, the sum of \$600,000,000 was expended for the same purpose and by the same authorities. This is an increase of 400 per cent. in highway expenditures in the United States in the comparatively brief period of eleven years.

Greater even than this discrepancy between the sums expended in 1910 and 1921 is the difference between the more or less unorganized efforts that characterized U. S. road-building campaigns eleven years ago, and the centralized, efficient method of constructing the nation's highways that is operative to-day.

When road-building was first taken up in a serious way in the United States, it was soon discovered that there was a great deal of confusion not only with respect to the proper types of surfacing to be employed, but also with respect to the correlation of federal, state and municipal efforts.

The century-old practice on the part of farmers of paying off their taxes in the form of road-building, led to a great deal of improperly directed and unsatisfactory road work that was really more harmful than beneficial. For example, road-drags were used by individuals who did not fully understand their proper employment, and the results in many cases were little short of catastrophic. A perfectly serviceable dirt road would be rendered useless by being

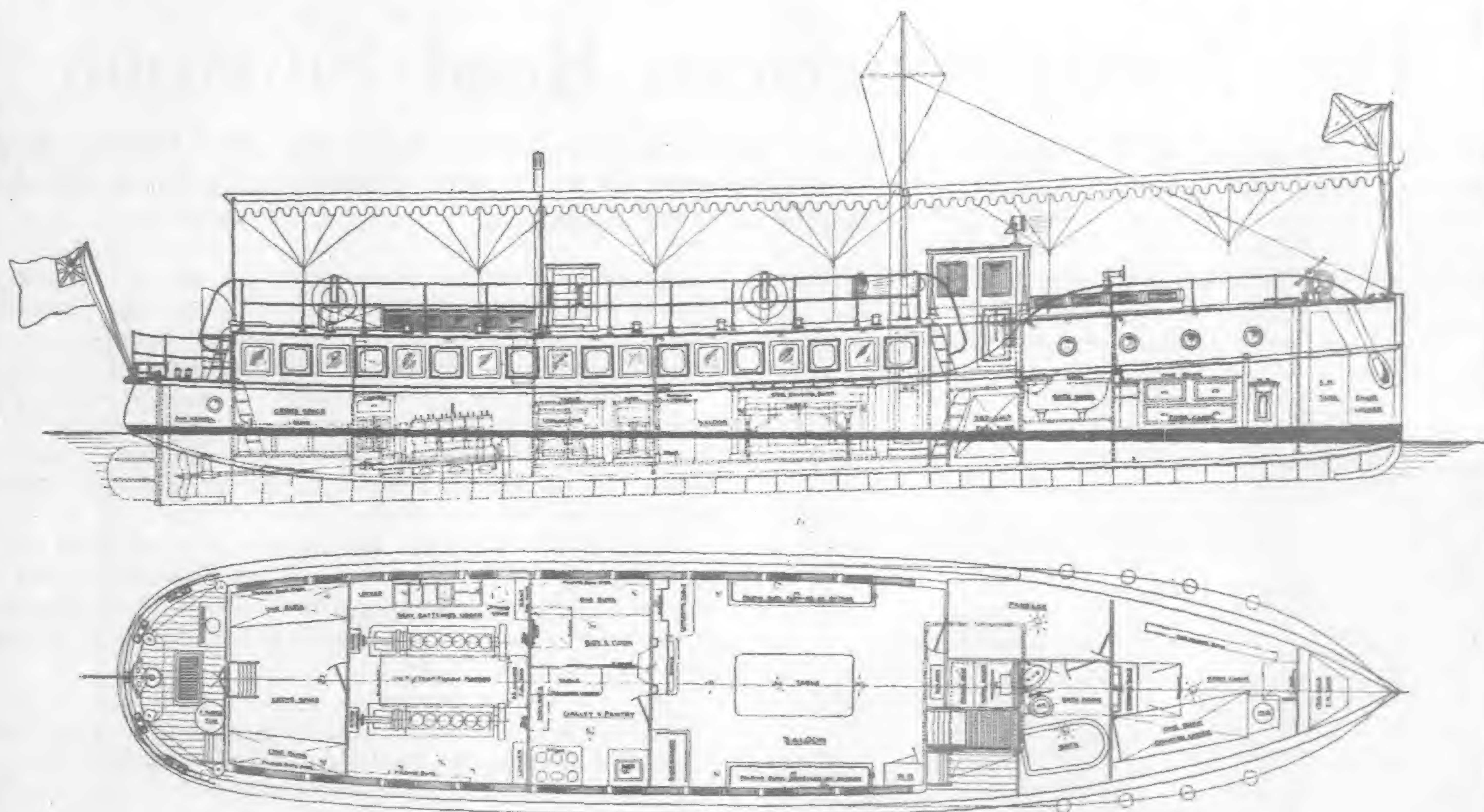


Through the wide, flat plains of the Middle Western and Western States, sand-clay roads, well-crowned, provide a comparatively cheap yet very serviceable form of highway construction

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A tunnel through solid rock in the mountain country of the West. Good mountain roads are costly to build, and are not constructed "over-night"

steeply crowned by loose dirt, masses of weeds, stones and other refuse that the drag had forced up from the sides of the road onto its centre.

Misunderstandings arose, moreover, between various authorities concerned in highway work—between state and county officials, between county and township, and so on—and in many instances there was a deplorable tendency to "let the other fellow do it," which could not but react unfavorably on what was one of the most vital and important problems of the day and age; the construction of well graded, smooth and permanently surfaced roads for use by the growing army of passenger and commercial motor vehicle users.

Federal Aid Plan Formulated

This confusion and lack of systematic endeavor resulted in the formation of a plan for federal good-roads aid, that has formed the framework for practically all important highway progress in the United States during recent years. The principal feature of this centralized system of road-building control, is that the U. S. government and the various states share to an equal extent in the expense of a system of roads that are being built to connect county-seats of every state in the union. When this system of roads is completed, transportation everywhere in the United States will be rapid and easy, and all except the smaller outlying districts will be in permanent communication with one another. The system will comprise 180,000 to 190,000 miles of public highway, and will form a perfect gridiron of well-surfaced roads within the boundaries of the country.

Since the roads comprised in this system are being built to the specifications of the federal government, they will be far

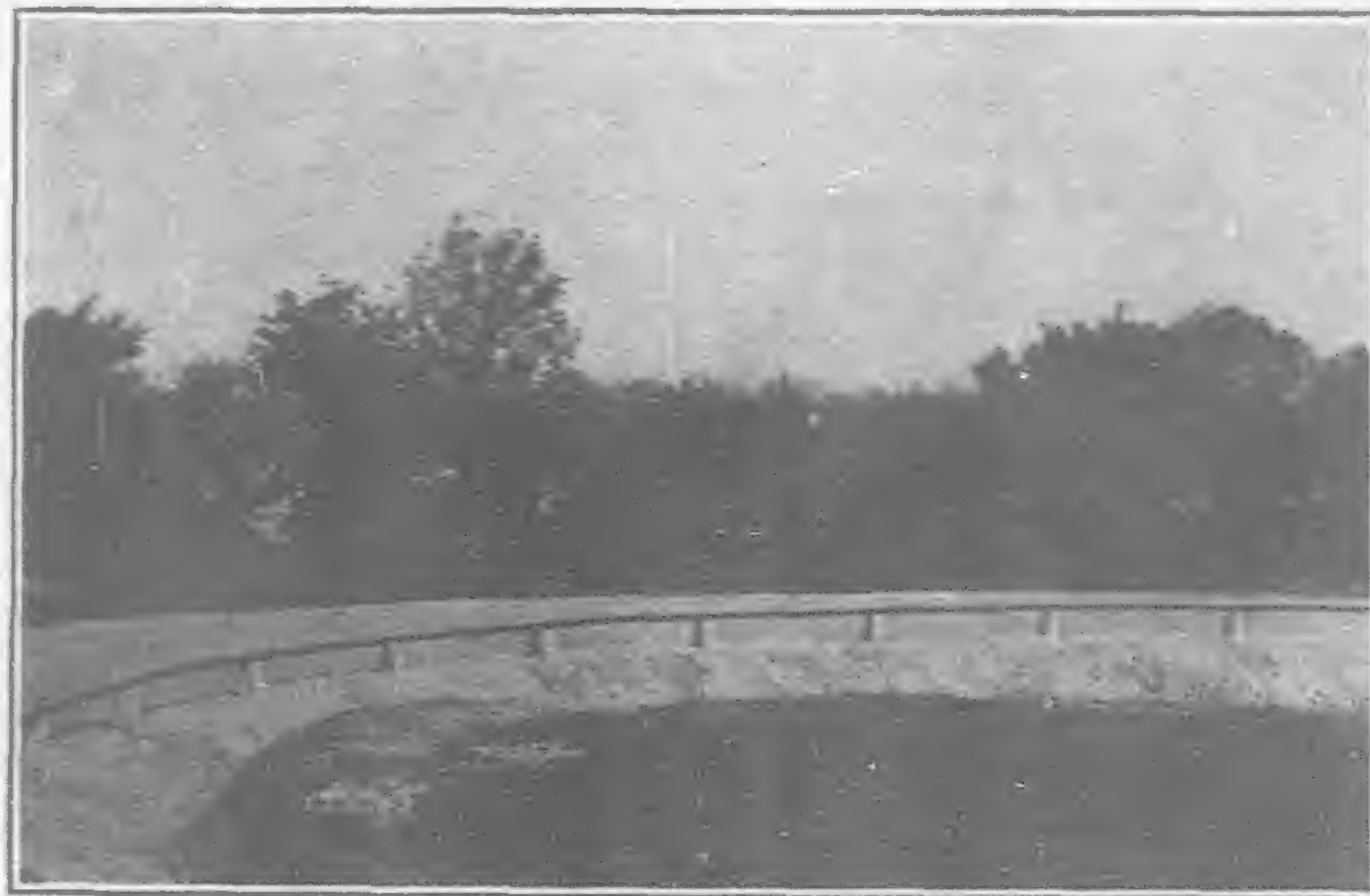
more uniform in quality than would be the case if the type and standards of their construction were to be left up to the various state and local authorities. Maintenance is to be provided by the states, and periodic inspections of their condition will be made by district engineers who work under the supervision of the U. S. federal bureau of highways, and of which there are thirteen—one for each of the districts into which the country is divided for road purposes.

The real significance to an outsider of this federal aid system of good roads building in the United States, comes from the fact that from a motor car and motor lorry standpoint the United States is the most highly intensified country in the world. With a registration of close to ten million motor vehicles, it illustrates perfectly the conditions that will obtain in other countries several years hence when use of the motor car and motor lorry has become equally widespread.

In another respect, the United States is ideally suited to be a proving-ground for methods of road construction and road building organizations. Topographical conditions in the United States vary widely. Within its confines may be found practically every type of territory that obtains anywhere in the world. The east of the United States is practically European in contour and climate, with its rolling stretches of fertile land, its numerous streams, and its network of cities and towns. Throughout the middle west of the United States may be found immense stretches of prairie land that resemble those in the Argentine and in certain sections of Australia. In the far west are steep mountains. In the south there are stretches of arid desert land, other stretches of swampy



One of the U. S. Government's scientific road-testing appliances is shown above. This machine travels over different types of road surfaces to determine the amount of wear which each will stand



Within sight of the beautiful Lincoln Memorial at Washington, is the Government's circular track for investigating various forms of road-metalling. A motor lorry, heavily-loaded, is automatically guided around the track, and the wear on the different surfaces is noted and recorded

soil and still other localities where semi-tropical vegetation flourishes and conditions resemble those of the lands that border on the equator.

Lessons to be Learned from U. S. Road-Building

From the immense task of providing adequate roads in all these various climates and locals of the United States, there may be learned definite lessons which will prove of considerable value to other countries who are now engaged in perfecting their road organizations.

The first of these lessons is the importance of centralized control. Without a systematic organization, a good-roads program is of very doubtful value. It is not possible to build and maintain a network of highways that will stand up year after year under heavy motorized traffic, without a carefully planned organization to unify and regulate the efforts of the various communities toward better highways.

The second lesson is the importance of scientific investigation of road surfaces and methods of road construction. Though the building of good roads is one of the most ancient of all arts—the Romans, and before them the Persians, knew how to build hard-surfaced roads, some of which have lasted up to the present day—modern highway building on a rapid and efficient scale is a development of the past few decades. The various tests and investigations made by the federal good roads authorities in the United States have proved of incalculable value in U. S. road-building work.

The third point is the matter of proper upkeep. It is not sufficient to build a good road, and then neglect it entirely under the impression that year after year it will continue to give the same efficient service as it did when first built, without a proper organization to inspect it at frequent intervals and to make any repairs that may prove necessary.

The fourth and last point is the advisability of not laying down any hard and fast rule for a single type of road to be used in varying types of countries. The kind of road that will prove amply satis-

factory for use on level or rolling ground will not do at all over mountain grades, where heavy frosts and thawings, great extremes of temperature, occasional avalanches and other destructive natural phenomena occur. A road that may be ideal for use in swampy country, will not prove of any value at all in the desert. It is fully as criminal to build a wide concrete road in sparsely populated country districts where there is little or no traffic, as it is to build a narrow dirt road where traffic is heavy and commercial vehicles of large tonnage are frequent users of the highway.

Value of Good Roads to Farmer

The benefits that centralized control of the good roads system of the United States have brought to the country, are especially noticeable in the case of the farmer. Because of good roads, the American farmer to-day is happier, more prosperous, and far more contented to stay on the farm, than he ever was in the days of rough dirt roads that were a cloud of dust in summer and a bog of mud in winter. The agriculturist in the United States to-day is within easy touch with the neighboring town or village, is able to travel swiftly and comfortably when on a pleasure trip, and he can visit his friends—no matter how distant their homes may be—in a fraction of the time formerly necessary for the journey.

Better roads in the United States have resulted, moreover, in the allotting to the railways of their proper function as long distance carriers, short hauls being taken care of by commercial and passenger motor vehicles. No better indication of the efficiency of motor transport service in the United States may be had than the fact that in practically every railroad labor crisis, the beginning of trouble finds a widespread motor organization ready to take the place of the steam carriers when a breakdown in rail transportation actually occurs.

The expansion of motor transportation and the extension and perfection of highways are interdependent. They have gone hand in hand in the United States, and both within the past decade have been nothing short of phenomena.

FIRST in the Field—



FIG. W4161. Nos. 0 to 1 1/2, without Leader Screw

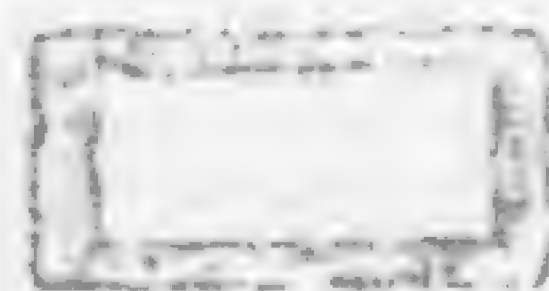


FIG. W4162. Nos. 2, 3, 4, with Leader Screw

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The Closed Car Show in New York

IT'S advent timed to coincide with the beginning of the autumn and winter seasons when closed cars are most in demand, the New York closed car exhibit was held in the Grand Central Palace during the week of September 24.

Held under the auspices of the automobile merchants' association of New York city, and considered in many respects a forerunner of the big national automobile show in January, this exhibit was by all odds the best and largest closed car show ever seen in the United States. It was a most convincing object-lesson of the steadily increasing popularity of closed motor vehicles and their suitability for all-year-round use.

One of the features of the 1922 closed car show was the increased popularity of the five-passenger sedan, in place of the larger seven passenger sedans formerly built on the same or slightly longer chassis. Buick, for example, was exhibiting a five-passenger sedan—called a touring-sedan—on both the four and the six-cylinder chassis. These are new Buick models for 1923, and are designed to meet the demand for moderate-priced closed cars. A trunk rack and trunk, with nickel guard rails, is standard equipment on both the Buick touring-sedans, and makes them highly desirable for touring use.

Buick was also showing five other closed models—the standard five-passenger sedan, the seven-passenger sedan and the four-passenger coupé on the six-cylinder chassis; and the three-passenger coupé and standard five-passenger sedan on the four-cylinder chassis. A crowd was always gathered around these handsome models, which with their Fisher-built bodies and carefully chosen equipment made a strong appeal to the prospective buyer.

The exhibit of Cadillac was notable for the inclusion of the new Victoria model, exhibited in New York city for the first time at any show. Changes have been made which gives the Victoria an appearance of greater length and less height. The seats have been widened and deepened, and the driver's seat placed directly behind the steering wheel. Another handsome Cadillac model which attracted great attention was the five-passenger coupé, a good-looking closed car of stylish, compact appearance and comfortable seating arrangement. Among other models, Cadillac showed a five-passenger sedan of the touring type, equipped with a trunk and trunk rack.

The popular five-passenger sedan was well represented at the New York closed car show. It formed one of the features of the Chevrolet exhibit (right) and of the Oakland display (below.)



While the majority of the cars exhibited at the show were fitted with standard bodies, at the same time there were some very handsome custom-made bodies on display, representing the highest type of exclusive coach work. Rolls-Royce exhibited a very beautiful Cabriolet, seating five persons, the interior upholstered in cream-colored pig-skin. The rear of the top of this Cabriolet is collapsible, giving a landaulet effect when desired.

Going to the opposite price extreme, we find Chevrolet represented by two coupés—one a two, and one a four-passenger type—and a five-passenger sedan. With their handsome lines and careful finish, these Chevrolet closed cars made a profound impression on visitors. The amount of real, pound-for-pound and dollar-for-dollar value that is packed into the low-priced closed cars of to-day, is indeed remarkable.

A number of cars of the light six-cylinder variety were exhibiting closed models. Among these were the Barley six, a five-passenger sedan model, built by the company which constructs the Roamer car. Jordan showed a custom-made suburban sedan body, finished in maroon with upholstery of the same color. Oakland showed two entirely new closed models that have just been brought out, a five-passenger sedan and a five-passenger coupé. The latter takes the place of the former four-passenger coupé, and is built on the same chassis as the sedan. A platform in the rear is provided for carrying a trunk, and the body back is protected by trunk bars. The five-passenger Oakland sedan has a larger cushioned front seat, and four doors.

One of the most attractive exhibits at the show was that of the Oldsmobile. An entirely new model was the four-cylinder Brougham, seating five passengers and of two door construction. The fine coach work and striking lines of all the Oldsmobile closed models made a marked impression on visitors to the exhibit.

It would have seemed strange to a motorist of ten or five years ago, when the closed car had not yet come fully into its own to witness a show of this nature given up entirely to the exhibition of closed models. To-day, however, the comfort, cleanliness and all-year-round satisfaction of the closed car are appealing to more motor owners than ever before; and the great success of the closed car show in New York is a good indication of the increasing popularity of enclosed body types the world over.

Automotive Japan

Potentialities of the Market

An Interview with William I. Irvine, U.S. Trade Commissioner

OPINIONS of the dealers as to the probable number of cars the market can absorb under normal conditions vary widely. The automobile does not enjoy general popularity and one is constantly reminded of this by the slowness with which pedestrians and vehicles respond to the vigorous hooting of the horn and sounding of siren. Although Japan has been a user of motor cars for more than a decade it is still young in the idea and this is one of the causes of the tardiness in road building. But it is a market well worth cultivating as is any which during a period of ten years averages approximately 1,500 cars a year.

How many cars will Japan take a year? With the clearing of stocks on hand, it is generally agreed that the market should be good for 2,500 cars per year with present road conditions. With a slight development of roads permitting touring, the market would absorb 3,500 cars a year. A conservative estimate of the number of cars the country can absorb in the next five years would be 15,000, of which, Americans should get at least 60 per cent. This figure allows for only a small number of new owners. Replacements will account for the great majority of orders, as operating conditions are so severe that the average life of a car is less than five years. This factor alone calls at least 10,000 replacements within five years. From this, it can be seen that although in the first stages of automotive use, the Japanese market is worth cultivating and deserves the careful attention of present and future exporters.

The Motor Truck Market

Japan is essentially a short haul country but realization of this has yet to dawn in force on shippers. The country is in need of many branch lines to serve interior sections and the question of the future is whether these lines will be developed as rail or highway routes. To some extent the answer is now being given by motor busses which are bringing rapid transit to thousands living off the main routes.

Railway building is very expensive owing to the mountainous condition of the country. Long grades and tunnelling are met in every journey of 100 miles or more. Japan is thickly populated and nearly every square yard under cultivation providing a basis for motor transportation. This development is retarded by road conditions which make the use of motor trucks impossible in many sections. But if the road plan of the government is carried through motor transportation will be introduced, for the cost of men and horse pulled carts is increasing. It is estimated that one out of every twenty-eight people in Japan are engaged as beasts of burden, drawing carts or engaged in other forms of manual transportation.

The use of the motor truck in Japan is quite recent. Before and during the first three years of the war less than 250 trucks

were in use, and of these few were employed in commercial work. But with the increased demands of industry which became manifest in 1918, the need for quicker and better transportation was felt and as a result more than 600 were imported in that year. Of these more than 200 were used in a motor bus service in Tokyo which served as a stimulus generally to motor transportation for in the following year although no large purchases were made for city buss work, nearly 1,200 were imported to be followed in 1920 by approximately 1,250.

According to figures of the department of home affairs there were in Japan on December 31, 1921, a total of 2,070 registered trucks. To this number must be added fully 500 owned by transfer agents but not employed because of the business depression and which are not registered because they have not paid the yearly tax, and another 250 unsold.

Very little road and street improvement is required to expand further the activity of the truck as is shown by the following figures. With the opening of the Tokyo-Yokohama and Kobe-Osaka roads will come a great impetus to truck transportation for merchants in these four cities are constantly harassed by the great cost of moving commodities between these points, and the loss of time, whether shipments come by rail or barges. This is a development that Japanese officials say will come within the next three years.

Significant of the change is seen in that the fact that three years ago practically all the imports were car chassis, while to-day about half are truck chassis. These light trucks are doing the missionary work for the larger motor trucks. It is significant that part of the first vehicles manufactured by the Jitsuyo Jidosha Seizo Company, Ltd., Japan's only active automobile manufacturers are being equipped with bodies suitable for carrying merchandise.

Operating Field of Motor Trucks

At present nearly all trucks are employed within city limits. Although distances between villages and towns in Japan, especially near the rail lines are very short, there is little inter-city hauling. The field of activity within the cities is limited for reasons already given. Contractors, for instance, still depend upon carts for the delivery of materials, due largely to the fact that slowness in loading and the failure of dealers to keep sufficient supplies on hand to feed the trucks with. However, whenever loading was prompt the trucks proved more economical than carts.

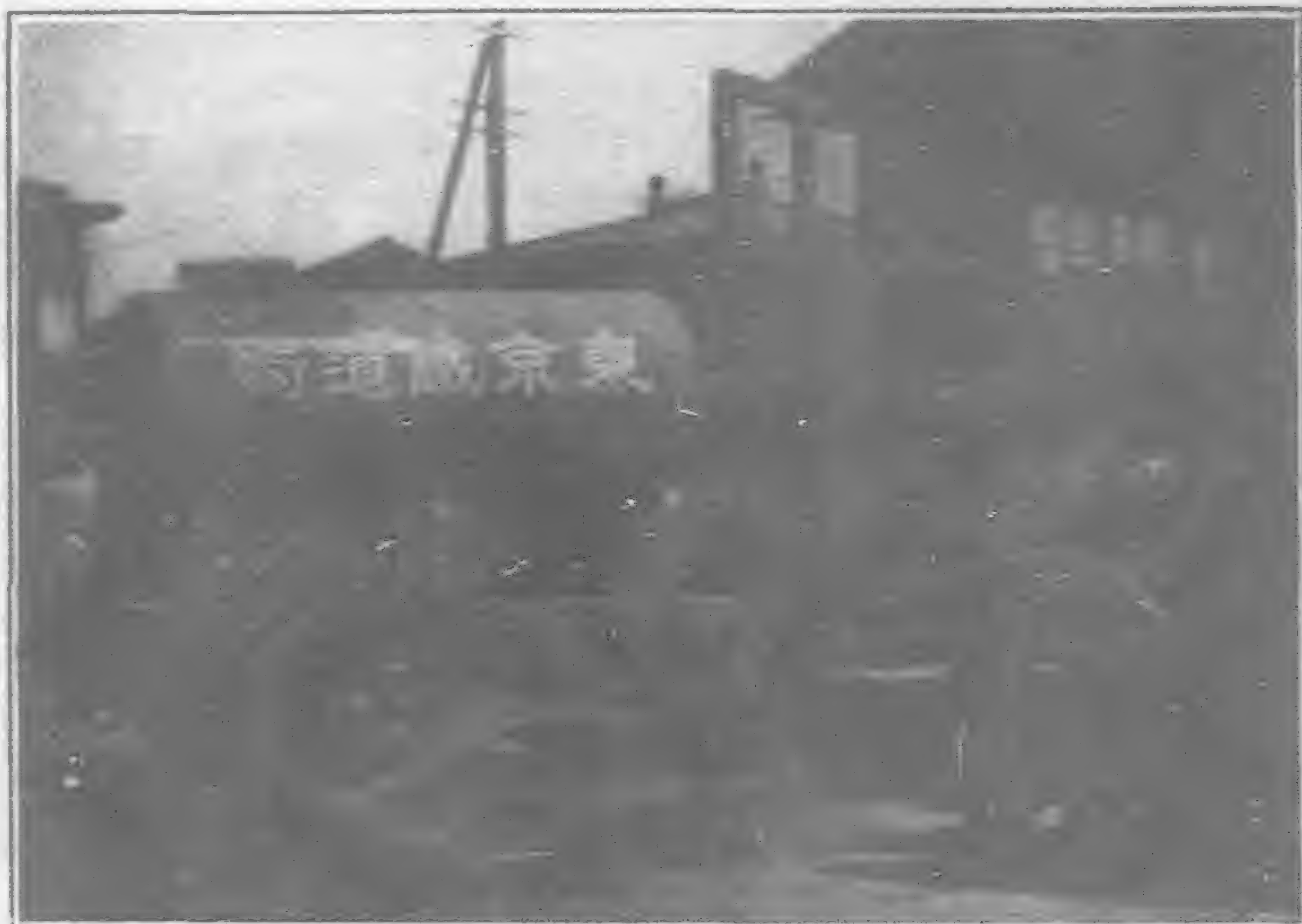
Contractors cannot use the heavy trucks which are a necessary part of the American contractor's equipment. The Japanese contractor is limited to the two-ton vehicle and his tax on that and the labor costs are as great as they would be on a five-ton truck. Under these conditions trucks cannot make the favorable showing as in America where the ton-mile costs is lowered by the use of heavy-duty trucks. An additional item of expense in the use of trucks is



Part of Fleet of Six White 2-ton Dump Trucks sold to Osaka Municipality, by Sale and Frazar



Two-ton Packard Trucks used by the Sewer Department, Tokyo Municipal Government



Federal 2-ton Sprinkler, Tokyo Tramway Bureau



Packard 2½-ton Sprinkler used by the Tokyo City Road Bureau



1½-ton Day-Elder, Worm Drive: "Black Maria" of the Tokyo Metropolitan Police Bureau



Bethlehem Truck: Delivery Car used by the Kaitusha Transportation Company



1-ton Vim Truck used by the Morinaga Confectionery Company, Tokyo

the fact that the Japanese truck driver will not load and unload and many trucks must carry a helper or depend for assistance at the loading and unloading points.

Manufacturers are slow to employ trucks as many of them enjoy the advantages of railway or waterside factory sites. In the islands of Kyushu and Hokkaido the mines in the former and the fisheries, canneries and lumber camps in the latter have the ad-

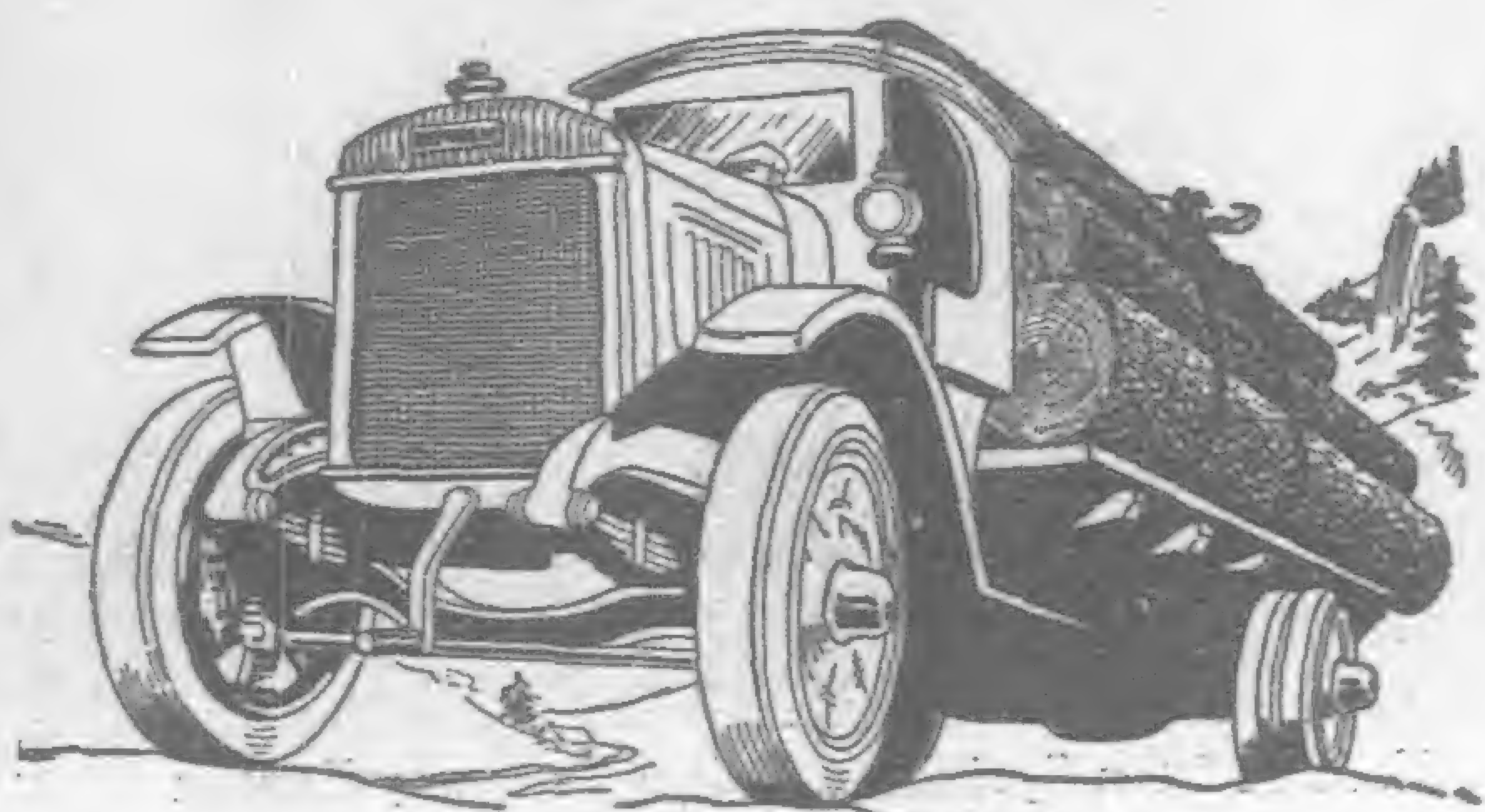
vantage of water sites. The use of trucks in these fields will be limited to general needs and not the movement of products.

Trucks in Municipal and Government Work

Municipalities in all parts of Japan are using motor trucks. The major use is in public works and sewage disposal and a growing

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„ XXX	Heavy
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tendency for street sprinkling. The city of Tokyo is naturally taking the lead in this direction and during Mr. Irvine's stay in Tokyo the municipality purchased 35 light and twelve medium trucks for sewage disposal. The city of Osaka is anxious to purchase trucks but is restrained by the prefectural length restriction, its



3-ton Pierce-Arrow Sprinkler used in the Imperial Palace Grounds, Tokyo

requirements calling for trucks 18-ft. overall, while the allowable limit is 16-ft. 6-in. The opinion was expressed that the municipal and prefectural authorities would soon agree or the matter would be referred for settlement to the department of home affairs.

All the large cities in Japan are confronted with a very difficult problem in the disposing of sewage. Japanese cities have no underground sewage system and traps have to be regularly cleaned. Hand carts and oxen and horse teams have been used but there is a great deal of complaint especially at the stations where the barges are loaded. Because of the limited radius of operation of the carts and wagons these stations are located in various parts of the city, and this causes property values to decrease beside the public nuisance created. An effort is to be made to locate stations on the outskirts and to haul by truck. At the present time a commission of sanitary experts are sitting to find a solution to the problem other than installing underground sewage pipes.

Street sprinkling is an important function in every municipality for only by constant wetting can the dust be held down. From morning to night men can be seen drawing sprinkling carts and storekeepers and householders supplement their efforts with pail and dipper, water being drawn from the open sewers. The number of motor sprinklers is totally inadequate and certainly there is a splendid opening for the sale of many trucks for this purpose. Dealers contend that more are not used owing to the limited funds of the city. It is said that each year definite sums are set aside for the purchase of motor equipment and this must be divided among all branches of the municipality and only a small part can



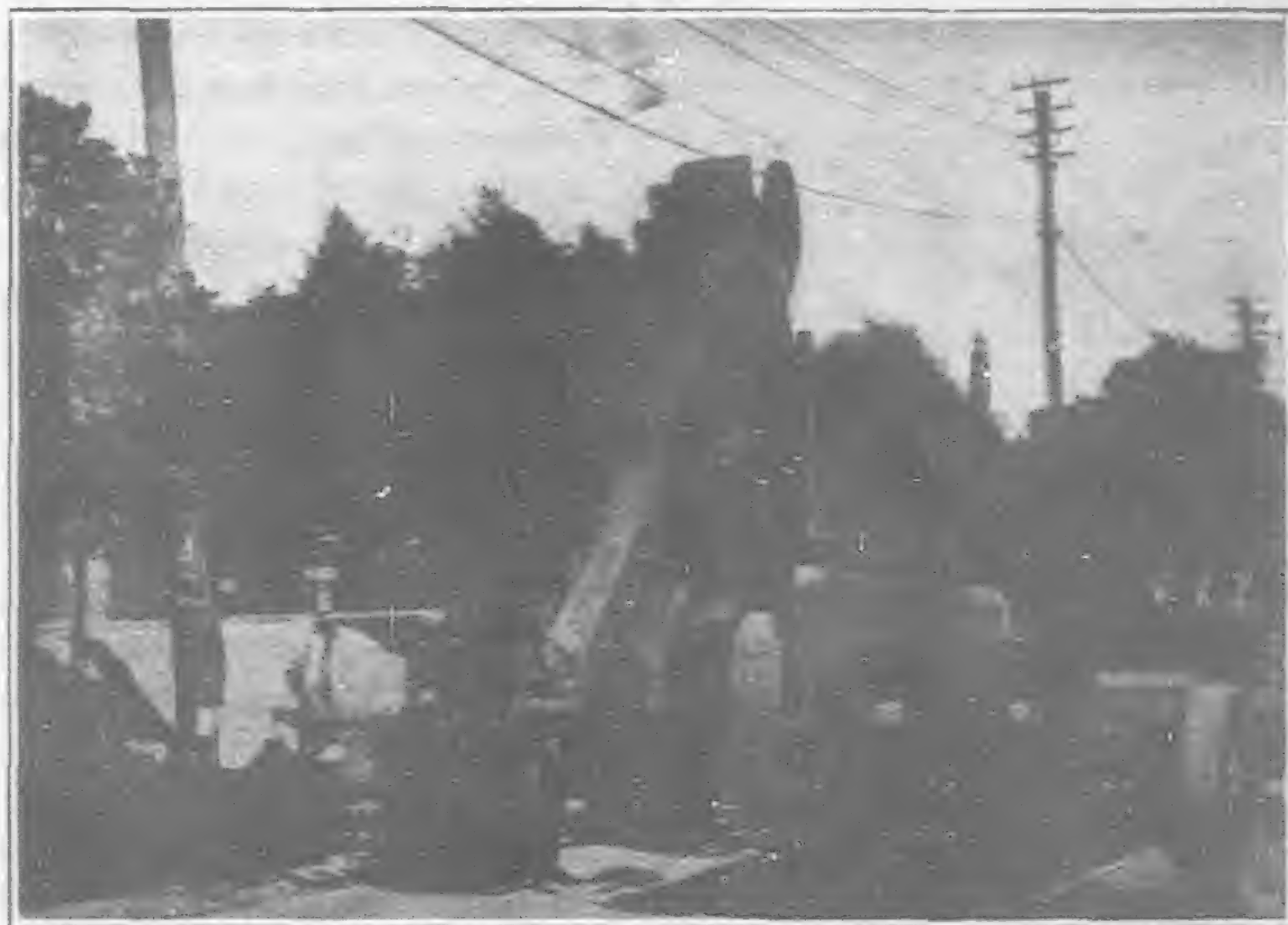
Two-ton White Truck used for Engineering Inspection Trips and Instrument Transport by the Nippon Kogyo Goshi Kaisha

be used for purchasing sprinklers. It appears that if a study were made of the waste resulting from the use of hand sprinkling carts it would show that the economy to be affected by the use of motor sprinklers would warrant special consideration being given to the subject. Flushing equipment cannot be used owing to the absence of hard surface streets and the failure to clean the streets.

The imperial government railways are using trucks in construction work and the engineers in charge of this activity are fully alive to the advantages of motor transportation, even to the possibility use of trucks as feeders to the main rail lines. Some interesting possibilities may develop from this source within a comparatively short time.

Fire Apparatus

Fire departments throughout Japan are motorizing and there are few cities that have not at least one piece of apparatus mounted on a motor chassis. The equipment in the large cities such as Tokyo, Osaka, Yokohama, Kobe, Kyoto, Nagoya and Sapporo includes the most modern types of triple-combination engines of 500 gallons capacity, while a few 750 gallons type are used. The great majority of this equipment is American, the cities of Tokyo and Osaka being almost entirely equipped with American machines. A few British

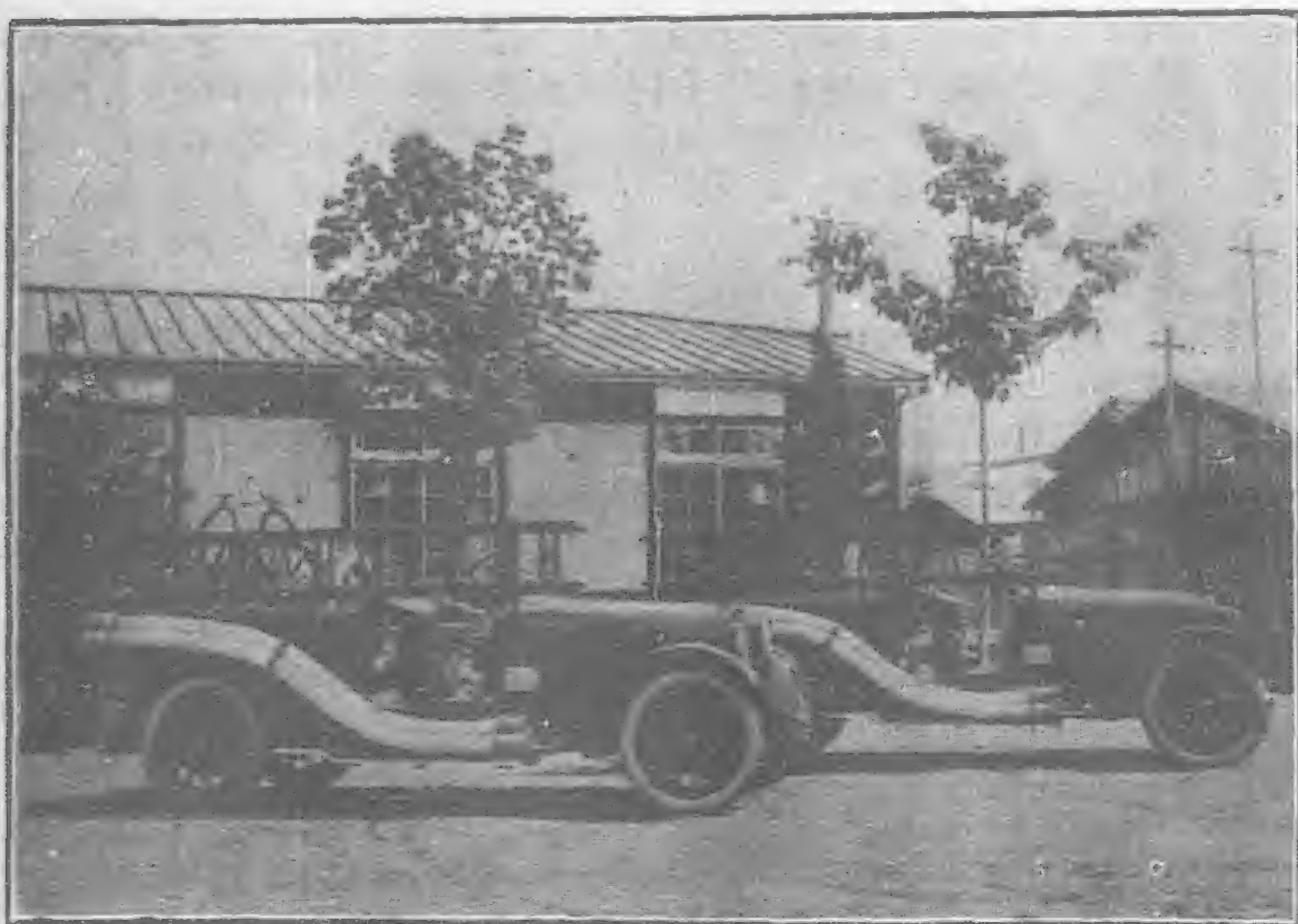


Federal 2-ton Dump Car and Link Belt Material Conveyor used by the Tokyo City Road Bureau, repairing Road near new Parliament Buildings

Merryweather and an occasional French and German machine have been imported but the dealers who have developed the fire business are of the opinion that American apparatus will continue to dominate the market for the reasons that American pieces are "in on the ground floor" and the apparatus is satisfactory.

In addition to the complete machines made by a single manufacturer there has developed for use in the smaller cities the practice of mounting equipment on passenger car chassis. This is especially true of hose carts, Tokyo having 26 and Osaka 22 while other cities have a few. These are mounted on American chassis, generally low price cars which sell in America for less than \$1,000. Another practice is to mount a Japanese-built pumping apparatus on an American truck or even on a passenger chassis. The Monita Manufacturing Company and the Suzuki Manufacturing Company, of Osaka, are building such pumps, the former a 300 gallons while the latter manufactures a gear pump made for use with a separate motor. The Japan Automobile Company of Tokyo, which is the largest fire apparatus distributing agency, makes its own 200 and 300 gallons pumps which are run by separate gas or marine engines.

Japanese cities are perhaps the most inflammable in the world and when a fire occurs losses frequently run more than a hundred houses. This is due to the type of construction employed in dwellings. Houses which are never more than two stories high, are set very close together and are, with few exceptions, made of wood



Fire Pumping Engine built at the Nakano Works of the Japan Automobile Company, on a Hudson Chassis

with paper partitions. The wood is very thin. All floors are laid with matting and there is an absence of protected electric wiring. There are no cellars and heating is done by oil stoves or *hibachi* which is a porcelain bowl, or wooden box with copper lining in which is built a small charcoal fire on a bedding of fine dry sand. Sparks from *hibachis* falling on the matting are responsible for many fires. In many houses the *hibachi* is set in the floor at night and over this the bedding quilts are laid so that the sleeper at least has warm feet. This arrangement leads to many fires. Bedsteads are not used nor is furniture generally, silk or cotton covered cushions serving as seats and are usually the sole objects of furniture. Cooking is done on the *hibachis* although kerosene and gas stoves are becoming popular for this purpose.

In the large cities fire watchmen are employed at night and they cover prescribed routes and about every twenty feet clap sticks of wood together signifying that all is well. In some cities the safety signal is a quaint song of a few notes, while in others bells are rung by the watchmen as they make their rounds. In the small cities towers are located at strategic points and from their heights of about 50-ft. men watch over the sleeping city and at the first sign of fire, ring great bells. In the large cities there are paid firemen but the small towns depend on volunteers.

Unless a fire is discovered at once the possibilities are that more than one house will be destroyed owing to the close proximity neighboring houses and the difficulty of getting in to them with fire apparatus because of the narrow streets. The cities of Tokyo, Osaka, Kyoto, Yokohama, Nagoya and Kobe have water supply systems with hydrants for fire purposes. Other cities must depend

upon the canals and open sewers. The latter are employed to supplement the water systems in the large cities whenever possible. There is no high-pressure service, the daily average pressure being from 30 to 50 pounds per square inch. Hydrant connections are 3½-in. by 5 threads. Size of nozzles: ½-in. and ¾-in. for hand pumps; ½-in. ⅝-in. and ¾-in. for steam and gasoline pumps under 200 gallons, and ¾-in. by 2, 7-ft. by 11½ by 1¼ for automobile pumps. the requirements for American fire engine makers are standard hose 2½-in. with hose connections of 3¼-in. diameter with 5 threads per inch, Whitworth standard thread.

Hose of local manufacture is generally employed but observation shows it is not durable and not capable of meeting the requirements of high-pressure fire engines. During the visit of Mr. Irvine to Japan the largest hotel in Tokyo was gutted by fire. The hose leaked not only at the joints, but along the line and from the size

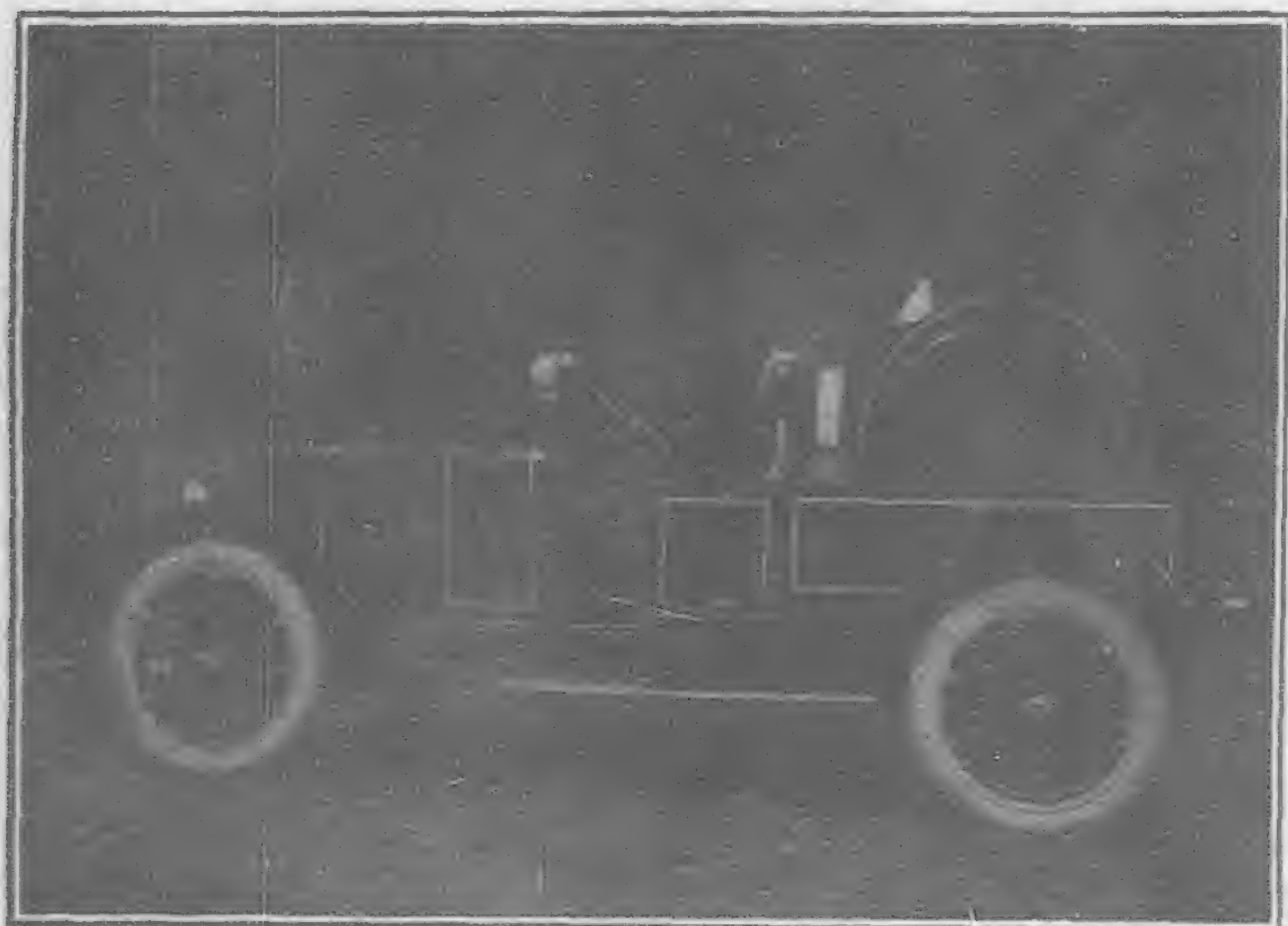


Fire Ladder Car built at the Nakano Works of the Japan Automobile Company on a Fiat Chassis

of the streams projected against the burning hostelry, it was evident that the engines were not working to capacity. It was claimed after the fire, in the controversy which followed, that full pressure was not used for fear of bursting the hose.

The increasing use of fire-fighting apparatus in recent years is reflected in the decreasing total of the claims paid. For the year ended March, 1918, the total amount of claims paid was Y.10,735,000; for 1919, the figure was Y.9,404,000 while at the end of March, 1920, it was Y.8,994,000.

The selling of fire apparatus is limited to a few dealers with more than 50 per cent. in the hands of one firm. The latter by reason of its organization outside of Tokyo has been very successful in selling equipment to the small cities, and it is reasonable to assume that if the other distributors were equally well organized, and pushed the business, they, too, could develop business without



Hose Cart on an Essex Chassis, built by the Japan Automobile Company at its Nakano Works

crowding the field. Japan is a country of small towns and in all these at least one piece of fire apparatus is required. Japan will continue to offer an attractive field to the manufacturer of fire apparatus, for only in the large cities are any number of buildings of less inflammable type being constructed than brick or stone. In the business districts of the large cities steel and concrete buildings are beginning to make their appearance, but it will be many years before fire-proof buildings will be generally used.

Army Truck

Definite figures as to the number of trucks owned by the army are not obtainable but dealers estimate that there are less than 200. These include not only the vehicles manufactured under the subsidy, but in the government arsenal and trucks purchased in the open market. There is a motor corps which has made a very thorough study of motor types both in America and Europe and as a result in one branch of the service an American truck has become standard equipment. There has been a tendency of the officers to build their own specifications which frequently eliminate makes, but this is diminishing and in the future selection will be based on performance as many different types have been purchased and their records are closely studied.

Each year a public test is held and all dealers enter cars and trucks and although no public verdicts are made the results of the test serve as a basis for future purchases. The test usually lasts two days, the first of which is devoted to a study of construction and design and the ability of the vehicles to run at different speeds in different gears and the proving of turning radius. The second day calls for a long test run ranging from 60 to 75 miles. Each truck carries its rated load and is accompanied by observation officers. During the run no repairs are allowed, all machines are loaded with fuel before starting and at the end of the run the balance of the fuel and oil remaining in the tanks is carefully measured. A total of 15 trucks participated in the test last year of which thirteen were American, one Italian and one French and two Japanese. The test is regarded by dealers as the most important event of the year and trucks are specially prepared for it. It also affords dealers the opportunity to use their literature effectively as each entrant is supposed to be supported with photographs and catalogs giving full details of his entry.

Taxi-Cabs

Taxi-cabs are making successful headway against the ricksha mainly for the reason that they are faster and cheaper for any distance of more than two miles. Organized companies have been established in the principal cities but there is room for more as generally it is difficult to get cabs. The largest taxi-cab company is located in Tokyo and owns 250 cabs of which 150 are in constant operation without exception all the cabs are mounted on passenger chassis and the especially built taxi-chassis has yet to make its appearance in a market where sturdy vehicles designed for this hard service are required. Some of the cabs in operation in Tokyo and Kobe are make shifts, the owning companies having been organized to provide an outlet for overstocked dealers. These are not provided with regular taxi-bodies, open touring types being employed. One company operating this style in Tokyo are using a French chassis, a light job, which is totally unsuited to the work, an unusual proportion of the total number being always in the shop.

The rates charged are 90 sen (1 sen equals about $\frac{1}{2}$ cent) for the first one-half mile and 10 sen for each additional quarter mile thereafter with a charge of 20 sen for each four minutes of waiting time.

The development of the taxi-business in Japan is retarded principally by the inadequate telephone facilities. Not only is the service poor but the number of phones is limited and private phones are confined principally to fair size business houses and the homes of the better classes. The securing of a telephone is a long and uncertain procedure. Each year the government, which operates the

system, allots a certain number of new phones to a city. The number is insufficient to meet the demand and hence a lottery is held as a means of impartial distribution. For 1922 the assignment of new phones to Tokyo was 5,250 of which 502 were to be allotted to public bodies. There were applicants for more than 60,000 phones. Public booths are stationed at infrequent intervals on the street and these are the only pay stations and as it may take ten minutes or more to get a call through people resort to them only in cases of emergency. The scarcity of phones has led to the business of telephone brokers who buy and sell phone privilege and these were selling in Tokyo early last year for as much as Y.2,500. During the business boom Y.3,500 was not an uncommon price.

The most successful taxi company in Tokyo is fairly efficient. It had a complete cost keeping system. According to its records it operated from June 1 to November 30, 1921, 1,024,532 passenger miles against a total cab mileage of 1,785,468, netting a profit of Y.72,572 (\$36,286). The company has paid an average dividend of 20 per cent. since it was organized. It maintains its own repair shops which are located at the headquarters garage where it also has houses which it rents to married employees and maintains a barracks for unmarried men. Chauffeurs are carefully instructed and occasional lectures are given on car mechanics and such topics as "safety first." Its cabs are rather small but they are built for the comparatively small Japanese who appear not to be uncomfortable when four or five are riding together. Cabs are stationed at the principal railroad stations and it is not an infrequent occurrence to see people waiting their turn for a cab, especially at the more distant stations. The company plans to add to its fleet. There is an affiliated company in Osaka which has been equally successful and is run on similar lines. The service in Kobe, Kyoto and in other cities is poor and there is great room for improvement.

The Motor Buss Development

Within the past three years the use of motor busses has extended to all parts of Japan so that there are to-day approximately 759 lines operating about 2,300 busses over routes estimated at 8,400 miles. This is highly significant movement as it indicates the trend of passenger development for the great majority of these lines are serving as feeders to railroads, the services provided being from rail points back into the interior. While all these vehicles are not trucks, many passenger chassis being used, this development should prove conclusive evidence of the stability of Japan as market for trucks.

Up to the present time all the vehicles used are either bodies mounted on passenger chassis or a low priced one-ton truck chassis. It is reasonably certain that as these vehicles prove the profitability of buss service larger jobs will be introduced with the coming of road improvements.

With the exception of one company all the lines are operated out of cities and towns and the greatest number and mileage is in those sections where rail transportation is limited.

The greatest number in any section is in the prefecture of Aichi in which Nagoya is located. Here more than 400 controlled by 35 individuals and companies are serving more than 820 miles. There are three prefectures: Fukuoka, Kumamoto and Nagasaki, in the island of Kyushu in which more than 100 busses are operated for a total distance of 1,600 miles. In the prefecture of Kochi in the island of Shikoku which is without any rail transportation, 130 are operated over more than 300 miles. More than 100 are in the prefecture of Hyogo and the adjacent section of Okayama. There is hardly a prefecture in the whole of Japan in which motor transportation is not to some extent provided by motor busses. An examination of the railroad map of Japan gives the answer to this universal use. Dealers say that the surface has only been scratched and that greater numbers will be used each year as the news of the success of the operating companies spreads. Road and weather conditions apparently are not a hindrance to these light busses for Mr. Irvine has seen them in operation in the city of Otaru in Hokkaido on streets covered with two feet of packed snow while most everything else

was moving on sleigh runners, including the ubiquitous rickshaw. Running on the same roads one frequently sees the most antiquated and ramshackled types of horse-drawn busses which are slowly giving way to the motor as the owners acquire sufficient funds and experience to run motor busses.

The movement of people continues to grow in Japan. Not many years ago a man who had traveled 50 miles from his native village stood out, but to-day everybody travels. Cheap railroad fares have made this possible and as a consequence trains, especially the second and third-class coaches, are always full. Street cars are congested at almost any hour of the day in all cities and the electric service between Yokohama and Tokyo in the rush hours is a fair reminder of the home rush on American elevated and subway systems. The western idea of quick travel has taken a firm hold on the people and as the public utility services are insufficient to meet the demand, motor transportation must be provided. In this fact lies the big future of motor transportation.

As yet but one large company is operating in a Japanese city. This is in Tokyo where service has been provided since the early part of 1918 by 160 trucks of which 150 are equipped with 18 passenger bodies. Unfortunately the company has not been well managed and is in financial difficulties at the present but plans are under way to reorganize and improve present routes and extend the service to sections in which there is an actual demand for transportation facilities.

The need for additional and better transportation service in Tokyo has been and still is very urgent. The city proper covers an area of 32 square miles and has a population of 2,159,308. Plans have been made for the inclusion within the corporate limits of the municipality of an area of 252 square miles, which will probably double the present population. This great number is badly served by a municipal electric railway which inadequately cares for limited sections, and by an elevated railroad which partly circles the city making possible rapid transit as the term is understood in America to those fortunate enough to be within its range. This is part of the Imperial Government Railways of Japan. Both of these mediums are badly congested practically at all times between 7 a.m. and 7 p.m. It was the recognition of this condition which brought about the organization of the buss company in Tokyo. Hastily organized it began operations without experienced transportation men and so it has deteriorated and its equipment is now in poor condition. There has been a lack of proper servicing and those necessary checks to prevent inefficiency and waste. Hope is now expressed that American capital will be interested in the company and under capable management the contemplated new equipment will put the company once again in the dividend-paying class. It is very important to the development of the motor buss idea that the Tokyo company succeed for upon its success probably rests the opening of other enterprises in Japan, as there are many fair sized cities which have no form of municipal transportation. In view of the street car congestion in other cities companies of a similar nature could be made profitable.

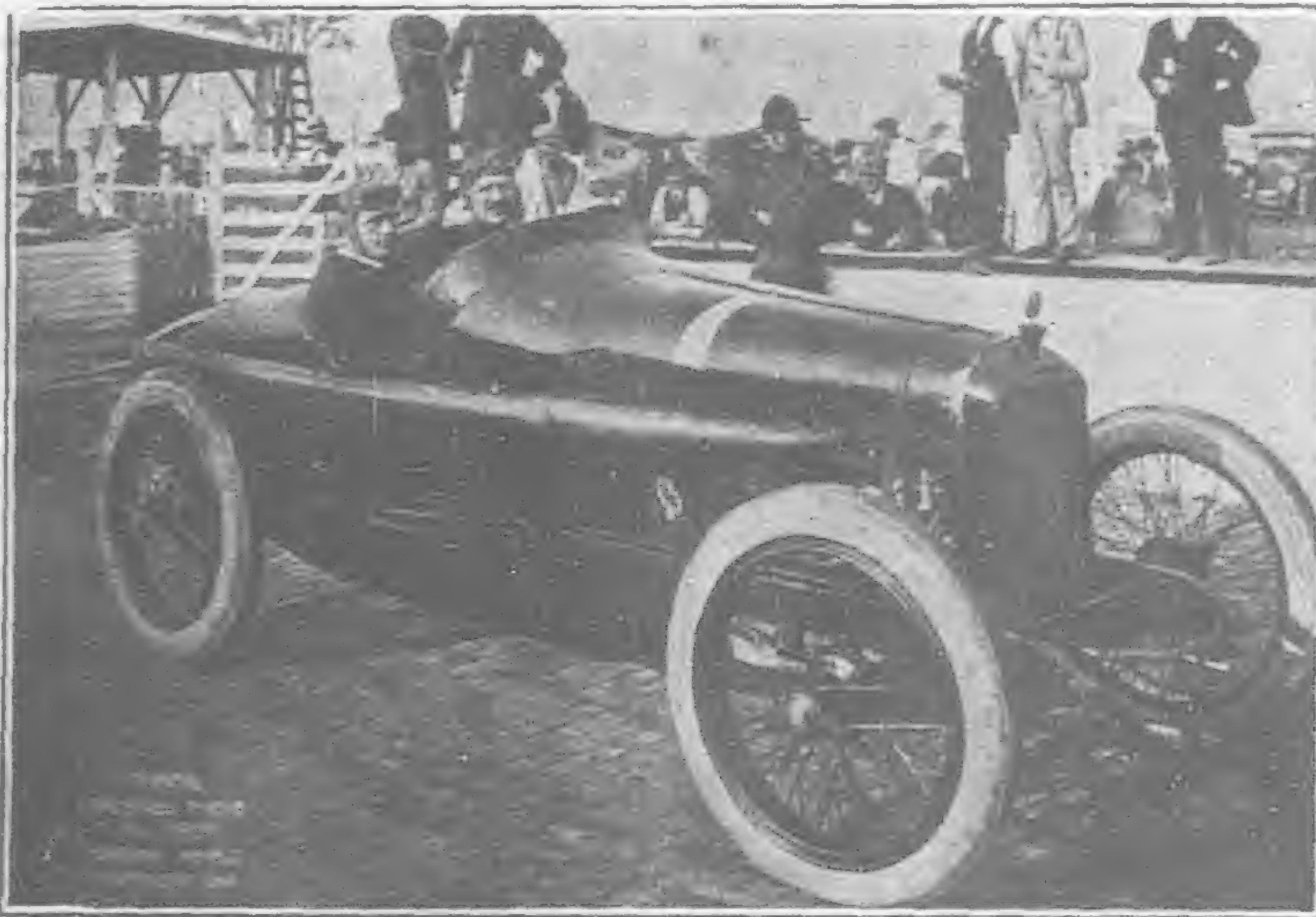
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AUTOMOTIVE exports will increase three-fold if stimulated by financing facilities based on collateral value of motor vehicles, deposit by foreign dealer, insurance of credit risk, and provision for co-operative disposal by bank and manufacturer of any rejected shipments, according to G. F. Bauer, foreign trade secretary of the National Automobile Chamber of Commerce.

Motor vehicles represent definite collateral value, just as much as cotton, grain or securities. Recognition of this collateral value has been taken as far as domestic trade is concerned. A recent indication is the erection in Chicago of a warehouse, where motor vehicles may be stored by a dealer as collateral, on which loans are issued.

In export financing, however, the collateral value of motor vehicles is seldom considered. A draft is discounted only as firm's standing warrants, regardless of the value that may be represented in the shipment.

This attitude is probably because of too little co-operation between the manufacturer and the bank and a lack of understanding as regards each other's problems. Any improvement is, therefore, possible only in a plan that proves satisfactory to both. To the manufacturer, it must offer protection from undue recourse; to the latter sufficient collateral and guarantee that the goods will not be thrown on the hands of the banker alone for disposal.

Negotiations are now on between the National Automobile Chamber of Commerce and certain bankers to devise a plan of this kind that will prove satisfactory all around. Based on co-operation between bank and manufacturer, it would provide this:

1. Dealer puts up as guarantee of good faith 25 per cent. of value of shipment.
2. Manufacturer discounts draft for 80 per cent. of face value, leaving other 20 per cent. standing until transaction is completed.
3. Bank insures itself against credit risk and charges premium of about 1 per cent. for six months to manufacturer.
4. Interest on credit extension is charged to foreign dealer.
5. Control of vehicles as collateral guarantee is retained by bank until payment is effected.
6. Disposal of vehicles, if rejected, is provided for in co-operative arrangement between bank and manufacturer, whereby latter contracts to give preference to returned goods in filling of any export orders on books.
7. Expenses of returning to U. S. of rejected vehicles are amply provided for in guarantee of 25 per cent. put up by dealer and forfeited in event of rejection of goods for invalid reasons.

The advantages from such a co-operative financing plan are manifold. The manufacturer is relieved of recourse. The bank avoids going into automobile merchandising, and if desired, could assume credit risk and collect premium for its own account. The dealer would have chance to sell vehicles before paying draft; but one-quarter of the present amount would be required to finance shipment from factory to destination; the credit with his local bank could be conserved for use in intensive sales development or in creating greater turn-over with resultant benefits to all from larger volume of business.

If then, co-operation will help us all in extending our foreign commerce, why not resort to it generally in advertising, selling, and servicing. It certainly ought to enable us to secure for all times 75 per cent. of the world's automotive export trade. The 75 per cent. would also then mean more than now, as the basis would represent a volume of business probably tripled what it is now.

Humber

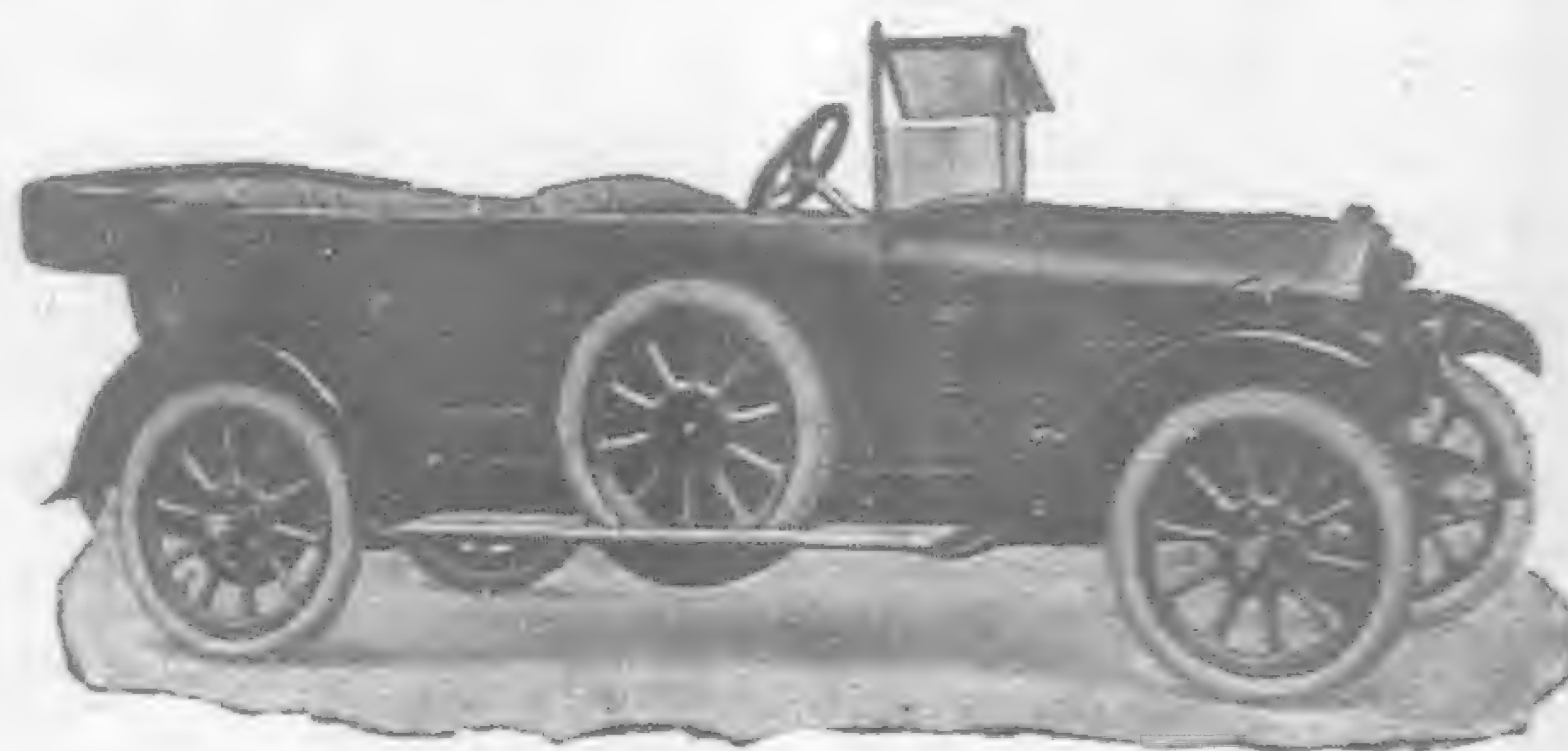
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SPARK-C, a device recently placed on the market by the Westinghouse Lamp Company is an instrument for the location of electrical faults in the high-tension portion of automobile and similar ignition systems.

The essential part of Spark-C is a small Geissler tube, filled with Neon. Neon is one of the five inert gases contained in the atmosphere, of which it forms about one part in sixty thousand. The other inert atmospheric gases are Helium, Argon, Krypton and Xenon.

Neon is chosen, however, instead of the more easily obtained Helium or Argon, because of its striking appearance when passing a discharge. Most gases in a Geissler tube give off a bluish or whitish light, and the intensity of this light is quite small, except when a very powerful discharge passes. Neon, however, even when passing quite small currents, sends out a striking fiery red light easily recognized even in the presence of strong sunlight; the sunlight would make the pale blue discharge in Argon quite invisible.

In the Spark-C is a Geissler tube, about two inches long, and about one-quarter outside diameter. The central part of the tube is somewhat constricted so as to increase the brilliancy of the discharge, which takes place between two electrodes of nickle wire welded to lead-in wires having the same co-efficient of expansion as the glass of which the tube is made.

This bulb is mounted inside a protective casing of black hard rubber $\frac{1}{4}$ -in. outside diameter and $7\frac{1}{8}$ -in. long. A window placed in the side of the casing opposite the narrow part of the Geissler tube, enables the discharge to be seen. This window is made narrow so that even in bright sunlight the discharge tube is somewhat shaded, making the red glow more striking. To avoid any danger of breakage the discharge tube is held in position inside the casing by thick washers of soft material. One lead of the tube is soldered to the brass tip at the pointed end of the casing. The other is attached to a lining of metal which is fitted into the rubber casing behind the discharge tube.

If now the brass tip is applied to any source of alternating or oscillating potential of sufficient magnitude, and the other end of the casing held in the hand, sufficient current will flow into and out of the condenser formed by the hand of the person holding the Spark-C as one plate, and the metal filler above mentioned as the other plate to cause the tube to show a red glow. This current will not, however, be felt by the person holding the Spark-C as the condenser formed as above mentioned has a very small capacity and so only passes a minute cur-

rent at ordinary frequencies. Any high frequency components, to which the impedance of this condenser would be so much smaller than larger currents could pass, will be of frequencies so high as to cause no shock. Since the amount of light depends on the current and this depends in turn on voltage and frequency, the device may be regarded as a voltmeter.

It has been found that when the Spark-C is used to test the condition of the spark plugs in a gasoline motor, a cracked and shorted plug or one heavily coated with carbon will at best, cause a dull irregular flicker in the tube, while a perfect plug will cause a bright easily visible glow, pulsating regularly. If, however, the gap between the points of the plug is too wide the glow will be exceedingly bright and the bulb in the Spark-C will begin to glow before actual contact is made between the brass contact tip and the top of the plug, sometimes up to a half inch away while a plug whose gap is correct should only cause appreciable light in the Spark-C when actual contact is made.

If trouble is suspected with the high-tension insulation, tracing along the insulation with the Spark-C will often find weak spots or leaks. Missing due to a dirty distributor can also easily be found and the trouble correctly diagnosed by the aid of the Spark-C. It is of great service in repair or maintenance work on automobiles, airplanes, motorboats or any internal-combustion motor using high-tension ignition.

On the Spark-C itself and engraved in the hard rubber casing in bold orange colored type will be found the following information:—

No light:—Open line or shorted plug.

Dim light:—Faulty plug or wiring.

Medium light:—Spark plug working properly.

Bright light:—Spark gap too large.

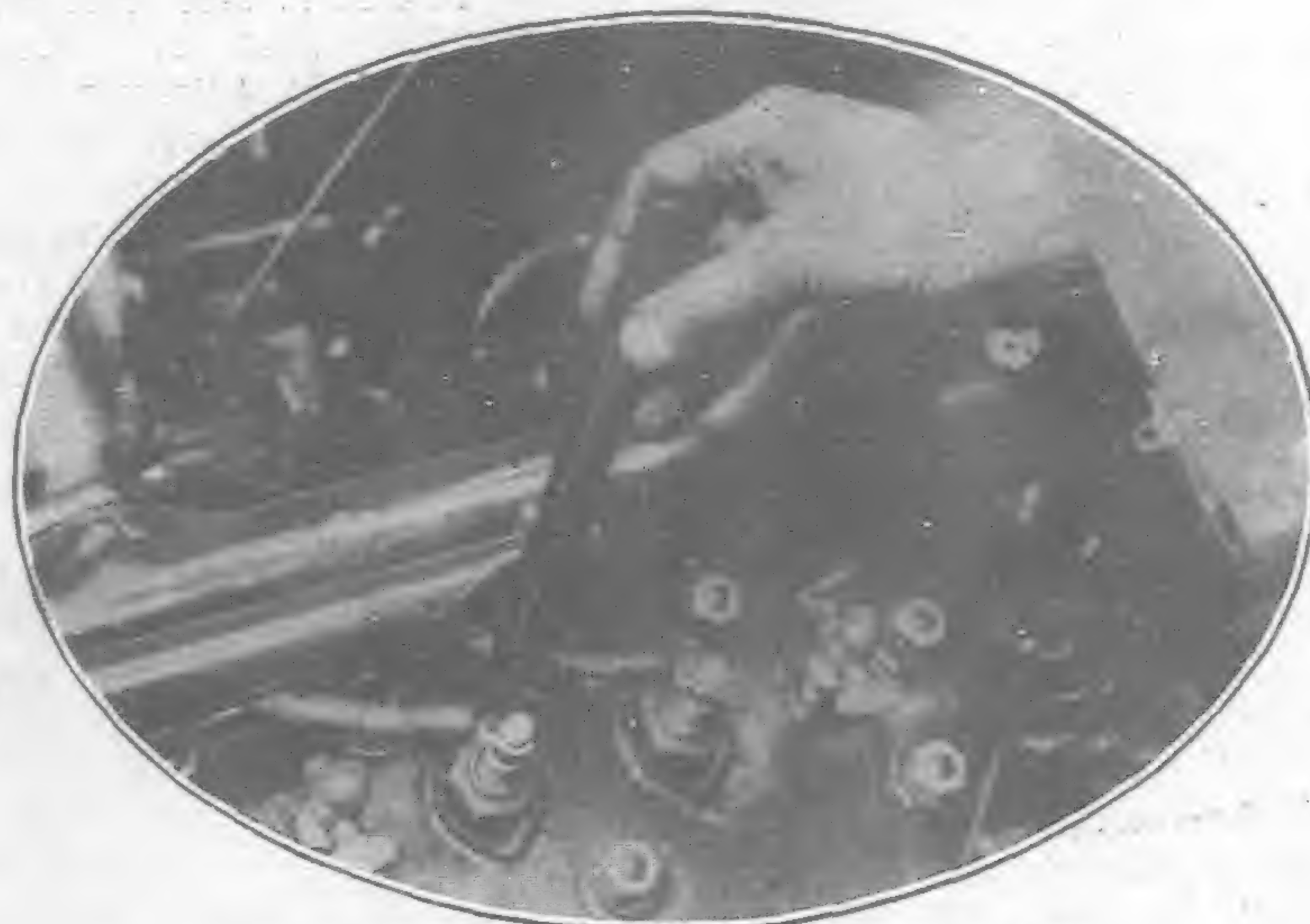
For instance:—No light—open line or shorted plug means that there is no voltage available to force the current into the Spark-C, and this may be the result of either of two causes:

First, the points of the plug may be so badly fouled that there is no longer any gap, in which case the current can flow across as rapidly as it is generated, allowing no chance for the voltage or pressure to build up.

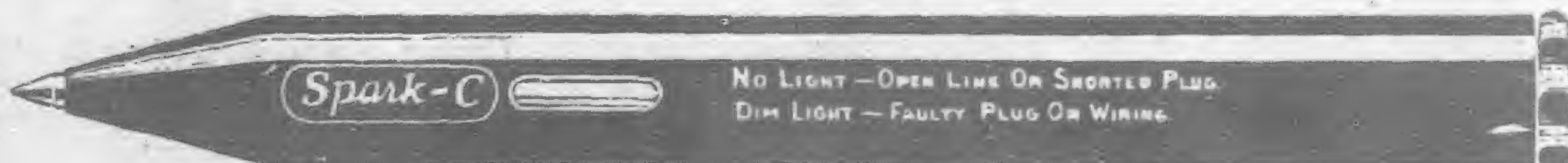
Second, there may be no current flowing at all on account of a broken connection at some other point. This can be readily found by disconnecting the cable from the plug and testing it at various points back to the distributor or induction coil.

Dim light—faulty plug or wiring: This is the result of too low a voltage, which is generally attributable to one of three causes:

First, there may be an



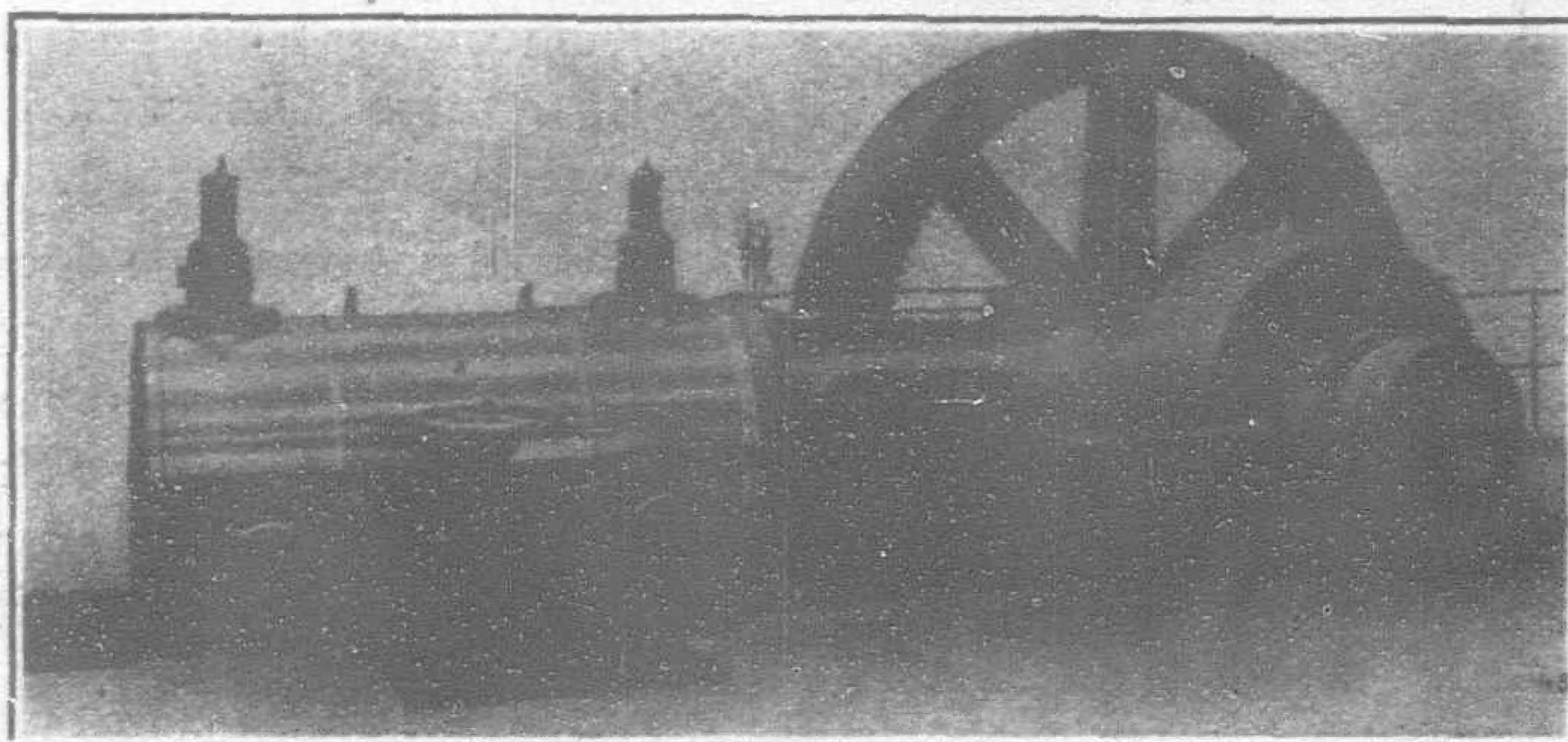
Testing Automobile Spark Plug with Spark-C



Spark-C Tester

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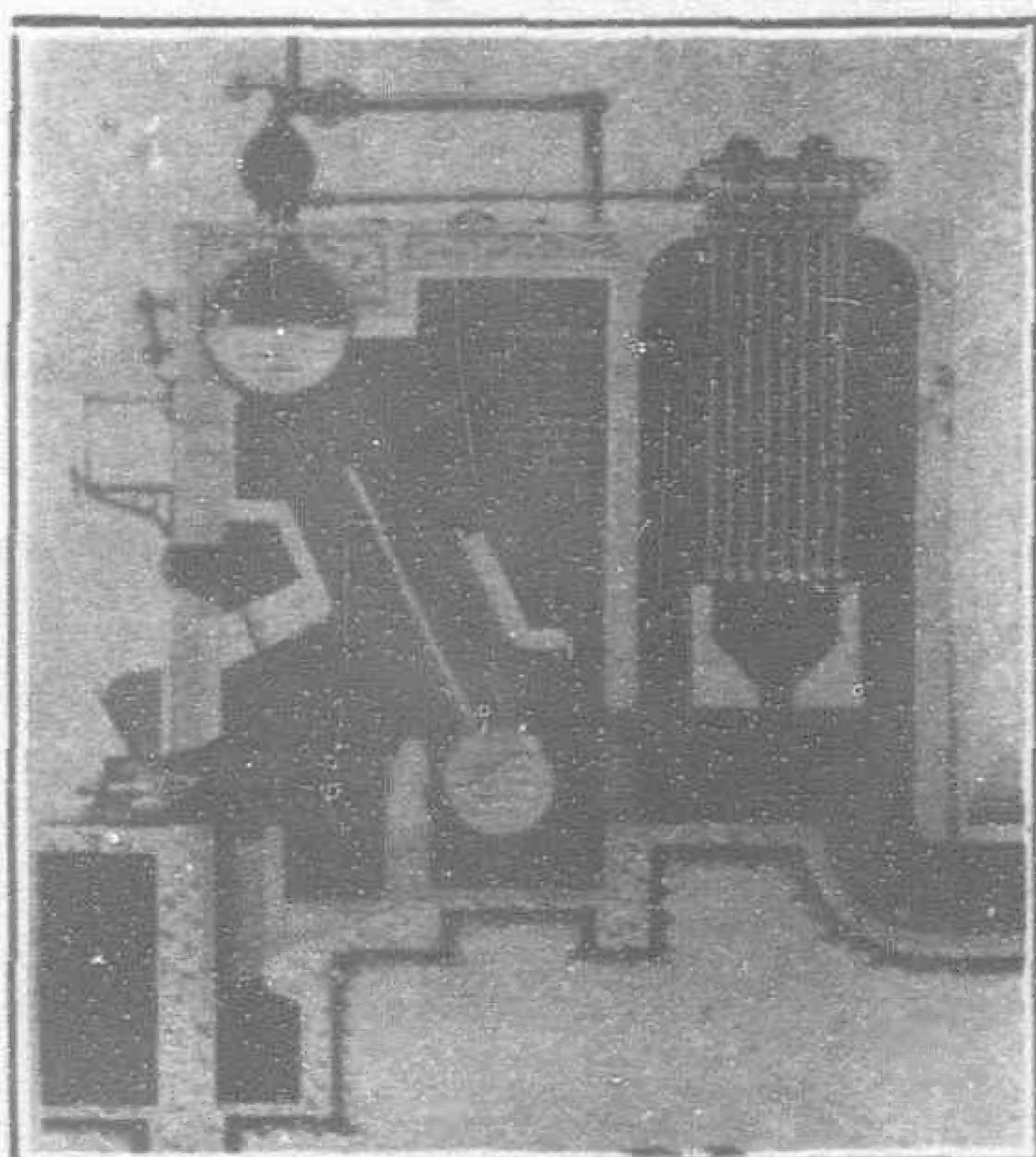
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accumulation of carbon on the points of the plug or on the porcelain insulation, which allows the current to pass without giving a good spark.

Second, the porcelain insulation of a plug may be cracked, allowing the current to cross at some other point. If, when the cable is disconnected from the plug and the Spark-C gives a bright glow when touched to the end of the cable, the trouble is definitely in the plug. If on the other hand, there is only a dim light on the end of the disconnected cable, then the third cause, that of faulty wiring, is indicated.

Medium light-spark plug working properly needs no explanation, as a spark plug which gives this indication may be assumed to be working properly.

Bright light-spark gap too wide: This is caused by the space between the points being too wide, which requires too high a voltage to force the spark across. The points of the plugs should be just far enough apart so that a worn dime will slide between them. If wider than that the spark becomes thin and weak or may not even jump at all.

Spark-C is considered of special value to ignition and battery service stations, garages, car sales rooms, automobile factories, car owners, etc., and should prove equally effective in the hands of those operating aeroplanes, automobile trucks, rural lighting outfits, tractors, motor boats, yachts and auxiliary power apparatus using explosion type engines.

It will not, however, give any indications on the low-tension circuits, as it requires a considerable voltage (500 to 800) to produce any discharge whatever.

There are many other uses for Spark-C that would take more time and space than is available now to explain, but it might not be amiss to mention the testing of the high-tension circuits of wireless plants, X-ray installations, etc. Amateur wireless operators

surely can appreciate its value to them and its popular price brings a scientific and dependable instrument within the reach of even the most modest experimenter.

Semi-Diesel Engines for Flying Invented

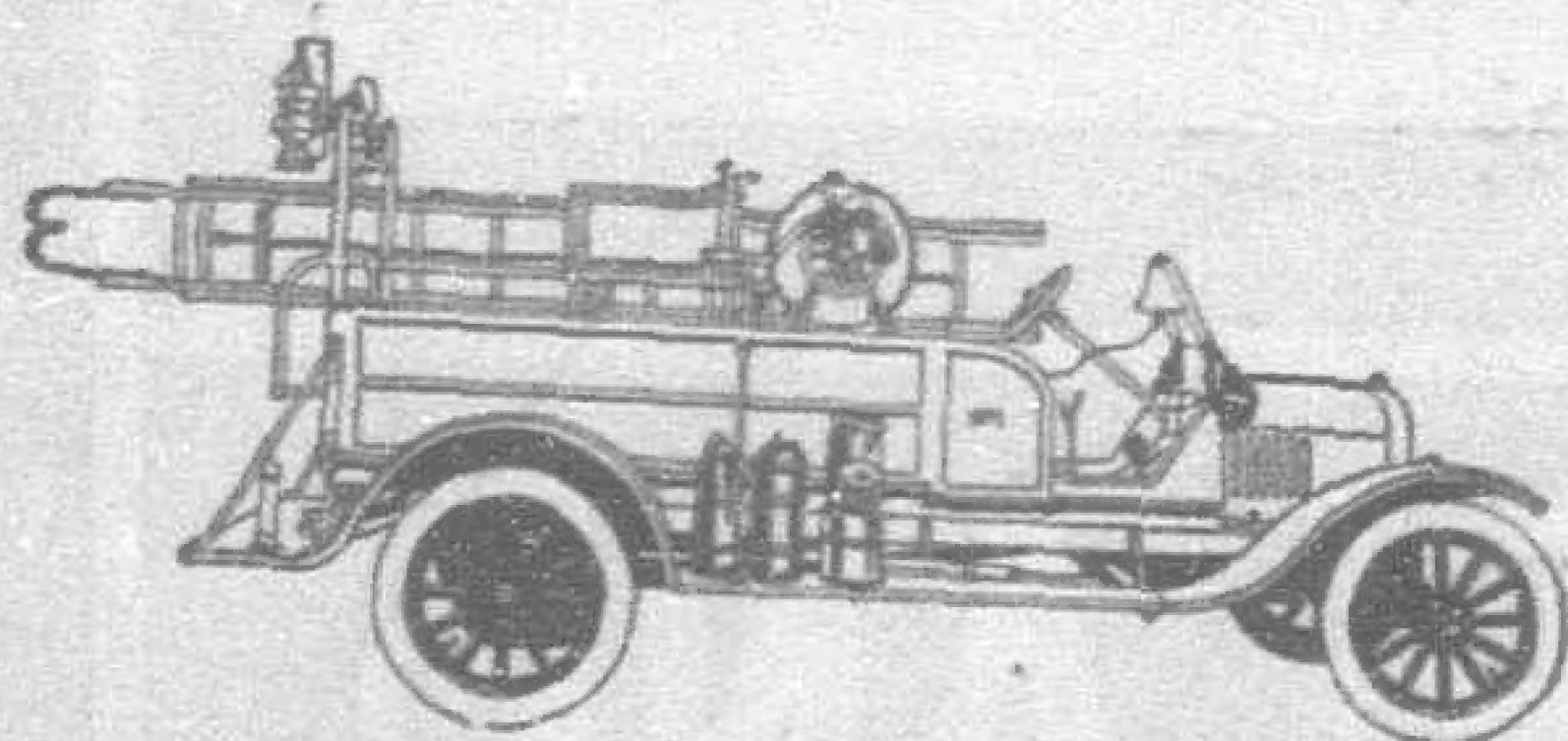
FOR a long time experiments have been in progress with a view to adapting the principle of the Diesel engine to aircraft and motor-cars, and there is reason to believe that complete success is near at hand, says a home paper. Whether England, France, or Germany will first be able to claim a really practicable result it is impossible to say, but whilst Professor Junkers in Germany has succeeded in making a six-cylinder high-speed semi-Diesel engine for aeroplanes, and a French engineer claims to have made a Diesel engine for motor-cars, experiments at the royal aircraft establishment at Franborough have, it is understood, reached a point which assures complete success. It is hardly necessary to point out that a great economy in running costs, besides reduction of fire risk, and the removal of one of the commonest causes of forced landings may be among the benefits, so far as aeronautics are concerned.

The Diesel principle does away with carburettor and magneto, and permits the use of heavy oils and high flash-point oils, obviating the necessity to use volatile spirit. Thus, besides the saving in the cost of fuel, the fire risk would be removed, which is a very important consideration as regards both aeroplanes and airships, and would, moreover, permit economical modifications in general design.

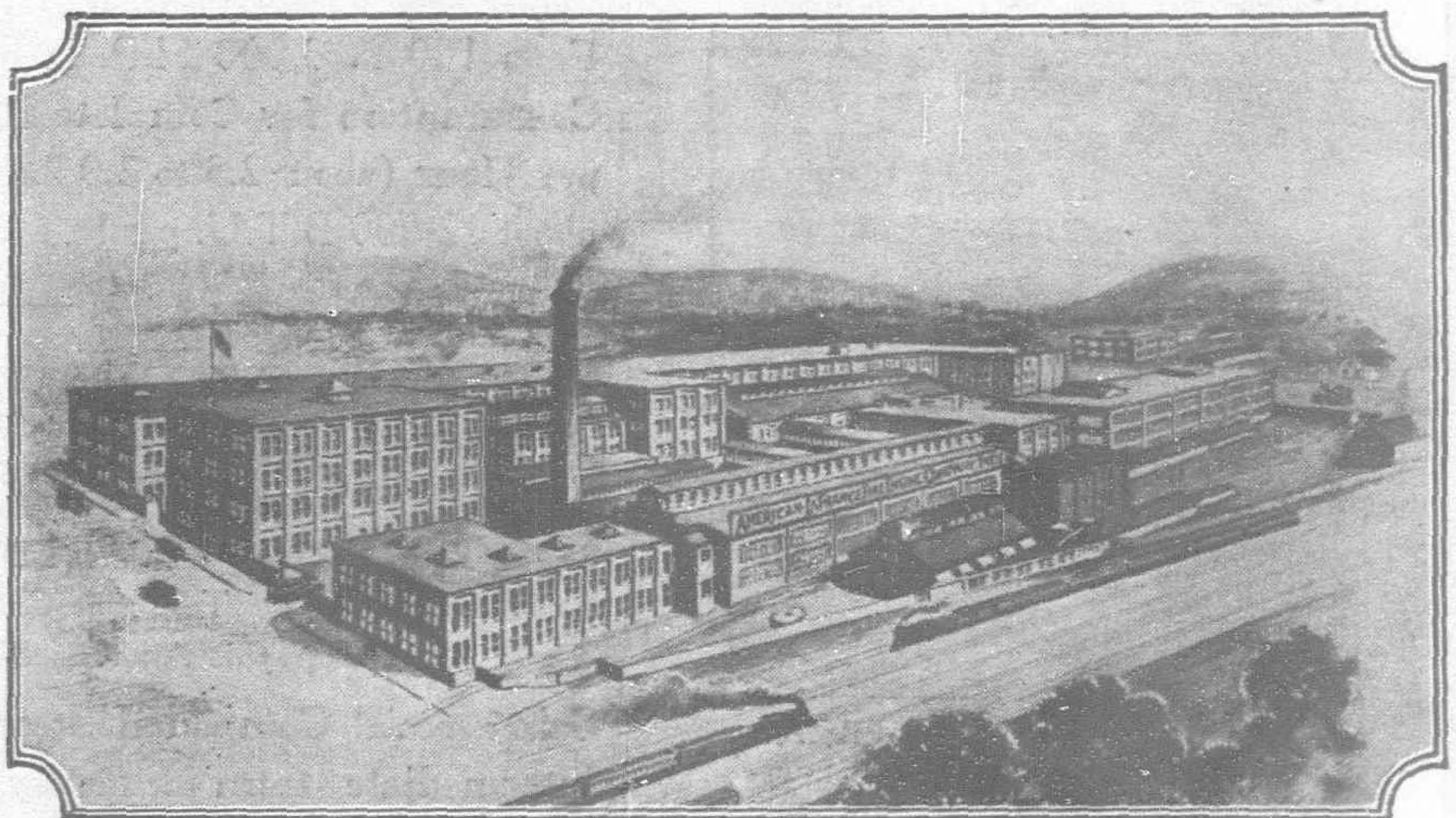


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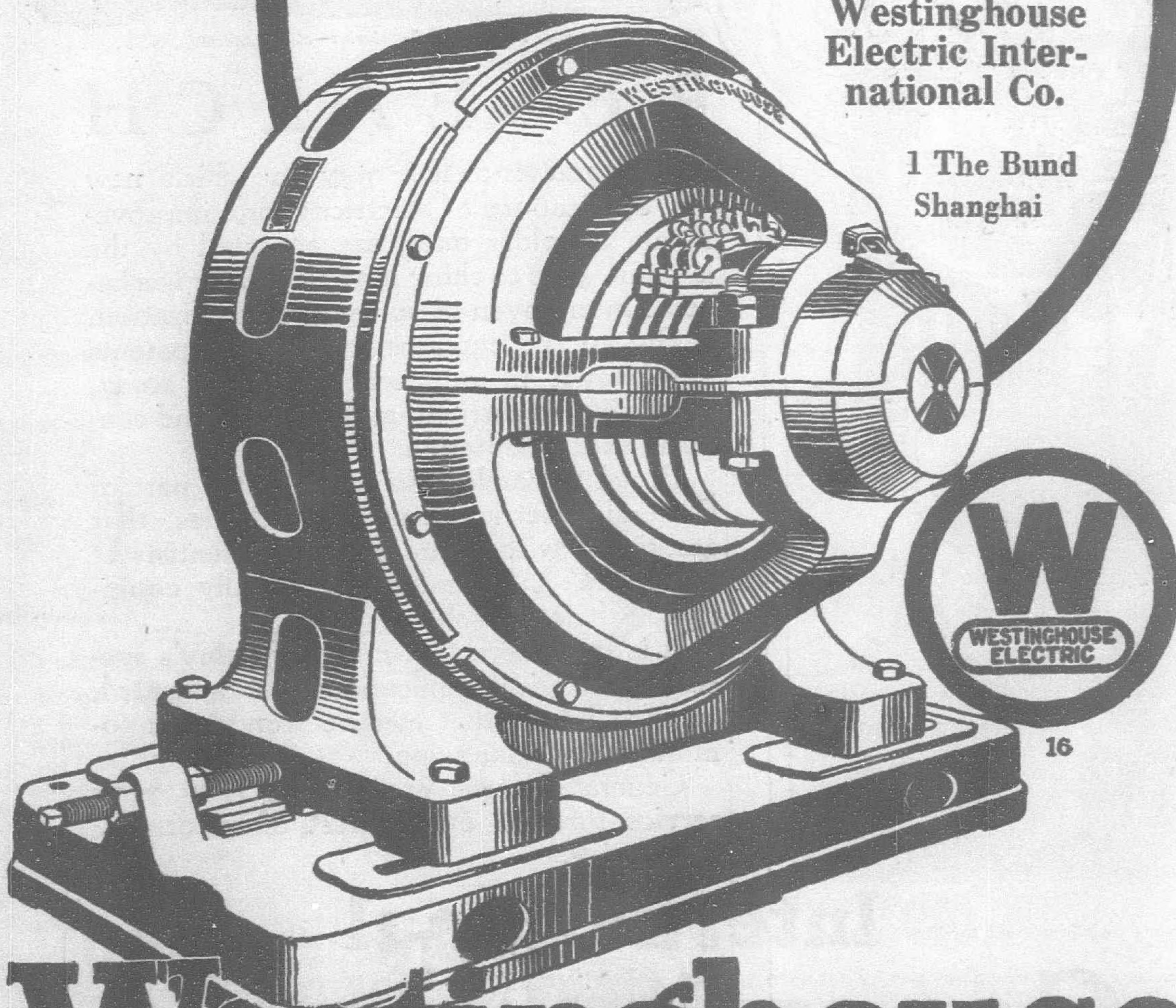
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